1.0 GENERAL INFORMATION

1.1 SCOPE

This specification covers methods and procedures for dry calibrating the JFC-47 Main Engine Control.

1.2 EQUIPMENT REQUIRED

1.2.1 Adjusting tools such as screw drivers and wrenches will be controlled by assembly floor supervision as to correct application in order to prevent part mutilation yet do the job requirement.

1.2.2 5694555T6 CIP Valve - Dry Calibration
T7 CIP Dial Indicator 2" stroke, .001" accuracy
T8 Speed Servo Dry Calibration Indicator, 2" stroke, .001" accuracy.
T14 Adapter Arm
T20 CIP Servo Position Locating Fixture
T15 Tt2 Dial Indicator 1" stroke, .001" accuracy
T17 Gage Block
T32 Adapter, Sequencing Valve Dry Calibration
T46 TV simulating Fixture with Two Dial Indicators, 1" stroke .001" accuracy and Last Word Gage
T55 Cam Motion Tool
T82 Min. Ratio Set Block
T95 Dummy Servo Housing
T96 Fixture - Tt2 Simulator
T112 Tt2 Servo Lock
Hunter Force Gage (10# load, 0.1# accuracy)

1.2.3 A pneumatic pressure and vacuum source capable of maintaining any pressure from 2 to 200 psia in order to simulate engine burner pressure (Pb) or engine inlet pressure (Pt2).

2.0 INSPECTION REQUIREMENTS

There shall be no Inspection requirement other than that data shall be subject to Engineering approval. Wherever initial shimming is changed to meet a functional requirement, this information must be recorded and witnessed as such on initial recording sheets.

3.0 SERVO HOUSING

3.1 From the match grind data sheet of the Assembly Check List obtain the "S" dimension from the null point of the CIP Pilot Valve. This dimension is from the bottom of the Pilot Valve Gear to the top of the boss around the Pilot Valve bore in the Pilot Valve Housing.

3.2 Place the assembled Servo Housing on the dry calibration bench with the parting face up. Support it on the Power Arm using #569455T14, Adapter. Place a thickness of the shims (which is equivalent to "S" dimension) between the underside of the Pilot Valve Gear and the top of the boss around the Pilot Valve bore to set the CIP Pilot Valve in the null position.

3.3 Being cautious on sealing surface, clamp a 1" Dial Indicator to the flange of the Servo Housing so that the tip of the Dial Indicator is against the upper surface of the Pilot Valve Gear. With the CIP Pilot Valve set in the null position set the Dial Indicator to zero. Set the Indicator so that there is .020" travel either side of zero.
CAUTION- Do not damage sealing surfaces.

3.4 Using a stiff rod, bottom the CIP Servo. Using a 2 to 3 inch depth micrometer measure the distance from the Servo Housing to the machined edge of the Servo Piston. Subtract this from the dimension obtained from HS1502, Para. 2, for zero displacement to obtain the displacement of the CIP Servo Piston. Attach Fixture #569455T7 and set the Dial Indicator to the displacement figured above. See Figure 3, Page 14.

3.5 Connect a 0-50 psia pressure source to the CIP Sensor. The pressure should be capable of being regulated to and read to $\frac{1}{4}$ psi.

3.6 Bolt Fixture #569455T20 to the Servo Housing in place of the Servo Stop Cover. The thumb screw on this Fixture and on #569455T6 should be used to move the CIP Servo Piston during the dry calibration.

3.7 With the CIP Servo Piston set at zero displacement, increase the pressure to the CIP Sensor to 5 psia. With this pressure held constant, increase the displacement of the CIP Servo until the CIP Pilot Valve returns to the null position as indicated by the Dial Indicator on the Pilot Valve Gear. Read the displacement of the CIP Servo and plot this point on the latest CIP Dry Calibration Curve, F-3883 (Ref. Page 16). Repeat this procedure with the CIP Sensor Inlet Pressures of 10, 20, 30 and 40 psia. Always rotate the CIP Gear (to eliminate hysteresis) when "nulling" the CIP Pilot Valve, or tap the fixture with a hammer at frequency of 1 to 3 times per second.

3.8 Determine from this plotted curve (Para.3.7) the rate and position adjustments which are necessary to make it coincide with the printed curve (F-3883) and make required adjustments.

Rate: -Counterclockwise swings curve counterclockwise, more effect at top.
Position: -Clockwise raises position of curve.

3.9 Repeat Paragraphs 3.7 and 3.8 until the actual and the desired curves coincide.

4.0 TEMPERATURE SERVO

4.1 Shim Temperature Cover Levers for proper location and parallelism, ref. HS1502.

4.2 Build up temperature cover, but it is not necessary to lockwire the Input Lever and Feedback Lever at this time. Do not install Position Adj. Spring.

4.3 Attach a Dial Indicator to measure Input Lever travel as shown in Fig. I, page 12.

4.4 Place a .501" block (#569455T17) between the Input Lever and Feedback Lever and holding them in a parallel position, set the Dial Indicator to null position.

4.5 Remove .501" block.

4.6 Pull the Input Lever in the direction towards the Indicator and record the travel beyond null. Record.

4.7 Release the Input Lever until it contacts upper limit stop. (See Fig. I).

4.8 The total travel of the Input Lever should be .060" minimum.

4.9 The values obtained in Para. 4.6 and 4.7 should be within .010" of each other. If not, remove or add shims under Evacuated Temperature Bellows until this condition is obtained.

4.10 If the Indicator reading in Para. 4.6 is larger, add shims under the Evacuated Bellows.

4.11 If the Indicator reading is Para. 4.7 is larger, remove shims from under the Evacuated Bellows.

Example: Value obtained in Para. 4.6 = .100"
Value obtained in Para. 4.7 = .040"

Total stroke therefore is .100" + .040" = .140" or ± .070"
Therefore, .100" -.070" = .030" extra stroke in pull direction.
Since lever ratio results in .006" stroke change for every .001" shim change. A total of .005" shims must be added (.03/6 = .005")

4.12 Lockwire the Input Lever and Feedback Lever and assemble Position Adjustment Spring.

4.13 Install the Temp. Sensor Simulator #569455T96 (screws to be torqued to 60 lbs.) Simulator must have with it a curve of pressure vs. temperature servo position which is determined by calibrating the simulator against the actual temperature bulb. Curve F-5408, page 15, is for reference only.

4.14 Mount Temp. Sensor Cover vertically as shown in Fig. I, Page 12.

4.15 Set Pressure in Temp. Sensor Simulator to value which corresponds to .953 servo position, then attach 43.6# weight to pin which connects Position Adjustment Spring to Input Lever.

4.16 Adjust Position Adjustment Spring to return Indicator on Input Lever to null position established in Para. 4.4.

4.17 Remove 43.6# weight and install standard Temperature Sensor. Torque screws to 60 lbs.

4.18 Place Sensor in 60°F bath and add weights until Input Lever returns to null position established in Para. 4.4.

4.19 Put sensor bulb in 30° or lower bath. Dial Indicator must show a minimum of .020" motion from zero position (null).

4.19.1 Put sensor bulb in 200° or higher bath. Dial Indicator must show a minimum of .020" motion from zero (null) position.

4.20 If stroke in Para. 4.19 is less than specified, remove Sensor and lengthen Connecting Rod. If stroke in Para. 4.19.1 is less, shorten Connecting Rod. Amount that the Rod must be changed can be calculated from the following formula:

Required change in length = (.020 - actual strokd) .174 + .001.

4.21 Recheck stroke after changing Connecting Rod per Para. 4.18, 4.19, 4.19.1. The standard Sensing Bulb should be used.

4.22 Reinstall Simulator and reset Position Adjustment for Para. 4.13 thru 4.16

4.23 Install Temperature Servo Cover on Linkage Housing. Set null Indicator on Tt2 PV using "S" dim. from flow sheet. Set Indicator #569455T15 to read 1.025 at 0°F end of Ng cam detent. Use tool #569455T55 to rotate 3-D Cam.

4.24 Set Pressure in Temperature Sensor Simulator to pressure value used in Para.4.15.

4.25 Adjust Rate Adjustment until Servo Position is .953" with PV at null position.

4.26 Vary pressure and obtain Servo Position.

4.27 Data should fall on simulator calibration curve.

5.0 MIN. - MAX. RATIO LINES

5.1 Assembly Spider Housing, Acceleration Limit Lever, Multiplying Linkage and P3 System. (Speed Servo not to be installed at this time).

5.2 Attach Dial Indicator to Housing to measure roller travel and a Last Word Indicator to measure P.V. null point. Last Word Indicator must be located on the P.V. itself.

5.3 Set rollers to .057" from pivot with min. ratio adjust by referring to scribed dimension on Multiplying Lever, and Fixture #569455T82. Ref. HS1502, page 14.

5.4 Position Droop Cam so that follower is on minimum radius of cam. Determine roller position. (This is max. ratio).

5.5 Referring to Curve F-4649, page 17, determine Wf/P3 for roller position found

5.6 Divide value obtained in Para. 5.5 by 52. Record.

5.7 Return Droop Cam to min. ratio position (Ref. Para. 5.1).

5.8 Attach Simulator #569455T46, T.V. Spring to Housing and engage spring with Multiplying Linkage. NOTE: Use TV Spring from unit being tested. Ref. Fig. 2, page 13.

5.8.1 Install spring so that open end of hook is facing away from Wf/P3 Roller Return Spring.

5.9 Install rigging pin in T.V. Pilot Valve and "zero out" Last Word Indicator at null position as logged on calibration sheet.

5.10 Attach a line with an air pressure source to P3 sensor so that pressure can be varied from 40 to 80 psi.

5.11 Set air pressure to 40 psi and adjust T.V. until T.V. Pilot Valve is nulled out and record reading on T.V. Simulator. Record.

5.12 Repeat above with air pressure at 80 psi. Record.

5.13 Subtract value obtained in Para. 5.11 from value obtained in Para. 5.12. Record.

5.14 Rotate Droop Cam for max. ratio condition. Ref. Para. 5.4.

5.15 Set air Pressure to 40 and adjust TV until TVPV is nulled out and record reading of Dial Indicator on TV Simulator. Record.

5.16 Repeat above with air pressure at 80 psi. Record.

5.17 Subtract value obtained in Para. 5.17 by value obtained in Para. 5.13. Difference.

5.18 Divide value obtained in Para. 5.17 by value obtained in Para. 5.13.

$$\frac{\text{Value, Para. 5.17}}{\text{Value, Para. 5.13}} = \text{\_\_\_\_\_}.$$

5.19 Compare value obtained in Para. 5.7 to value obtained in Para. 5.18, If values are equal min. ratio has been properly set.

5.20 If value obtained in Para. 5.18 is greater than value obtained in Para. 5.7, adjust min. ratio to move rollers away from pivot.
NOTE: When adjusting rollers for min. ratio, attach dial indicator to measure roller position and note change on Dial Indicator when making adjustment. This is important since adjustment may slip and reference point is lost.

5.21 If necessary to readjust min. ratio in Para. 5.20, repeat Para. 5.8 thru 5.18 until value obtained in Para. 5.18 is within ±.05 of that obtained in Para. 5.7
NOTE: Sensitivity = .05/.001 approx.

6.0 SEQUENCING VALVE OPERATION

6.1 Install sequencing valve, spring and retainer in Linkage housing.

6.2 Install rubber gasket to replace "HiCeal" in servo pressure transfer tube line.

6.3 Install test fixture #569455T95.

6.4 Install Power Lever and index to 15° as per procedure for setting Idle and Military Droop. Ref. Para. 7.5.1.

6.5 Attach Pressure Gages to S.O.V. and recirculation Valve signal lines.

6.6 Connect a .032" orifice between the gage lines.

6.7 Supply 200 psi to servo line in Linkage Housing. Ref. Fixture #569455T32.

6.8 Adjust button on P.L. until S.O.V. signal = 150 psi with PLA between 1° - 6° and circulate valve signal = 150 psi with PLA between 6° - 12°.

6.9 Rotate PLA from 0° to 15° in 1° steps and record pressure in S.O.V. and recirculation valve signal lines [illegible] 6° & 12°.

7.0 IDLE AND MILITARY TRIMMERS

7.1 Preliminary setup.

7.1.1 Shim under Trimmer Housing per HS 1502 so that holes in Trimmer Housing line up with holes in Servo Housing.

7.1.2 Locate Trimmer Housing with respect to P.L. Shaft per HS 1502.

7.1.3 Build up Trimmer Housing and install nominal shims as experience dictates. (Suggested shims, .020 in Idle and .120 in Military.)

7.1.4 Adjust acceleration limit cam follower all the way into lever.

7.1.5 Install 3-D cam and position and lock cam at 59° position as follows:

7.1.5.1 Locate detent in 3-D Cam and rotate 3-D Cam counterclockwise looking into open end of Ng bore until 0° end of detent is located.

7.1.5.2 Using depth micrometer, measure from surface of Tt2 Piston to parting face of Linkage Housing. Record.

7.1.5.3 Subtract .075" from reading in Para. 7.1.5.2. Record.

7.1.5.4 Reset Tt2 Servo Piston to dimension obtained in Para. 7.1.5.3 and lock with Tt2 lock #569455T112.

7.1.6 With follower still in detent, attach #569455T8 to measure Speed Servo Position. Set Dial Indicator to read 1.357.

7.1.7 Install #569455T46 and attach Dial Indicator to measure roller travel. With droop cam position at min. ratio position, set Dial Indicator to read .057.

7.1.8 Attach Dummy Servo Housing #569455T95, Power Lever, and Trim Blades.

7.2 Droop Slope

7.2.1 Set P.L. at 75° - 120°, idle trim 2 turns from full counterclockwise.

7.2.2 Adjust Military Trimmer so that a roller position of .2124" ± .001" is obtained with Ng position of .500".

7.2.3 Vary Ng Servo from .600" to .300" in .100" increments. Slope of line must match slope of line shown in Curve F-5407, page 18.

7.2.3.1 If slope is steeper than desired, remove shims from under Tt2 reset lever bracket.

7.2.3.2 If slope is shallower than desired, add shims under Tt2 reset bracket.

7.2.3.3 This requires removal of Tt2 reset bracket. Shim until shope is obtained.

7.3 Trimmer Housing Location for Minimum Interaction

7.3.1 After obtaining desired slope, reset the 75° - 120° lever angle and .500" Ng servo position. Adjust Idle Trimmer from full counterclockwise to full clockwise and note if roller position changes. If a change in roller position occurs, Trimmer Housing must be repositioned with respect to its location from Power Lever centerline as follows:

7.3.1.1 If a clockwise adjustment of the Idle Trim Blade causes rollers to move toward min. ratio, Trimmer Housing should be moved toward the P.L.

7.3.1.2 If a clockwise adjustment of the Idle Trim Blade causes roller to move toward max. ratio, Trimmer Housing should be moved away from the P.L.

7.3.1.3 When no apparent motion occurs, a final check should be made as follows:

7.3.1.3.1 Set Idle Trim Blade two turns from full counterclockwise, PL at 75° - 120°.

7.3.1.3.2 Bring Ng servo from .800" position to .495" position and note roller position.

7.3.1.3.3 Set Idle Trim Blade at one full turn from full clockeise, PL at 75° - 120°.

7.3.1.3.4 Bring Ng servo from .800" position to .495" position and note roller position.

7.3.1.3.5 Value obtained in Para. 7.3.1.3.4 should equal value obtained in Para. 7.3.1.3.2 within .006".

7.3.1.3.6 If value obtained in Para. 7.3.1.3.4 is greater than the value obtained in Para. 7.3.1.3.2 by more than .006", then Trimmer Housing must be relocated toward Power Lever.

7.3.1.3.7 If value obtained in Para. 7.3.1.3.4 is less than value obtained in Para. 7.3.1.3.2 by more than .006", then Trimmer Housing must be relocated away from Power Lever.

7.3.1.4 Scribe Housing in final location.

7.4 Military Trim Set Point

7.4.1 Adjust Idle Trimmer so that it is two full turns from full counterclockwise position and Military 5 clicks from full counterclockwise.

7.4.2 Set PL at 75° - 120° and bring Ng servo from .800" position to .495" position and record Wf/P3 roller position.

7.4.3 Adjust Military Trim Blade to be within 5 clicks from full clockwise position.

7.4.4 Bring Ng servo from .800" position to .495" position and record Wf/P3 roller position.

7.4.5 The mid position between Para. 7.4.2 and 7.4.4 should be .213" roller position. is. $\frac{7.4.2 + 7.4.4}{2}$ = .213"

7.4.5.1 If the roller position, as determined in Para. 7.4.5 is less than .213", remove shims from Military Trim Push Rod.

7.4.5.2 NOTE: .001" worth of shims is equivalent to about .003" roller travel.

7.4.6 After completion of shimming, set Military Trimmer to .213" roller position. This should occur at mid range of adjustment.

7.5 IDLE TRIM SET POINT

7.5.1 With Ng servo .495" rotate Power Lever from 40° position until no change in roller position occurs and set P.L. protractor to read 59° at this point. Stop plate should then be set so that the min. power lever stop is at 0° on the protractor.

7.5.2 Set P.L. at idle (15° Index Pin location).

7.5.3 Move Ng servo from 1.300" position until Wf/P3 rollers move to .115" position and note servo position.

7.5.3.1 Desired Ng servo position is 1.236".

7.5.3.2 If Ng Servo indicator reads high, remove shims from Idle Trim Rod.

7.5.3.3 If Ng servo indicator reads low, add shims to Idle Trim Rod.

7.5.1 NOTE: .001" add or shims is equivalent to approximately .001" Ng servo change. Shim until Ng servo is 1.235" with roller at .115" position.

7.5.2 Recheck military set point. This should not have changed. If change did occur, readjust Trimmer Housing location per Para. 7.3.

7.6 Idle & Trim

7.6.1 With Military Trimmer set at nominal position (Ref. Para. 7.4.6) and P.L. at 75°, rotate idle trim within 5 clicks of full clockwise position.

7.6.2 Move Ng servo from 1.30" position until .115" roller position is obtained. Ng servo indicator should read 1.15" or less. Record actual value.

7.6.3 Return Idle Trimmer to point 2 turns from full counterclockwise.

7.6.4 Set P.L. at 75° and rotate military trimmer within 5 clicks of full counterclockwise.

7.6.5 Move Ng servo from .300" position to .495". Roller position should be .199" or less. Rotate Military Trimmer within 5 clicks of full clockwise and move Ng servo from .300" to .495" position. Rollers should be at .241 or more position.

7.6.6 Reset Military Trimmer to nominal position.

8.0 ACCELERATION LIMITING ADJUSTMENT

8.1 To be done after Idle and Military set points are shimmed and min. and max. limits are adjusted.

8.2 Remove Servo Housing and set Dial Indicator on WF/P3 rollers to read .057 when droop cam is set closest to min. ratio position.

8.3 Move Ng servo to 1.245" position and adjust cam follower on acceleration limiting lever to locate WF/P3 rollers at .246 position.

8.4 Run calibration as indicated below:

Speed Servo Dial Indicator Set	Actual Position	Spec. Position
1.45*		.121 ± .002
1.40		.124 ± .002
1.35		.136 ± .002
1.30		.165 ± .002
1.20		.233 ± .002
1.15*		.246 ± .002
1.10		.242 ± .002
1.00		.211 ± .002
.90*		.157 ± .002
.80		.172 ± .002
.70		.209 ± .002
.65		.221 ± .002
.55		.217 ± .002
		.205 ± .002

.40	.186 ± .002
.35	.185 ± .002
.30	.145 ± .002
.20*	.090 ± .002
.10	.052 ± .002

8.4 Bottom Ng servo coil at low speed end and record roller position (this is failsafe position). Record.

8.5 After obtaining suitable correlation between wet and dry calibration, acceleration limit calibration check points may be reduced to points indicated in Para. 8.4 by *.

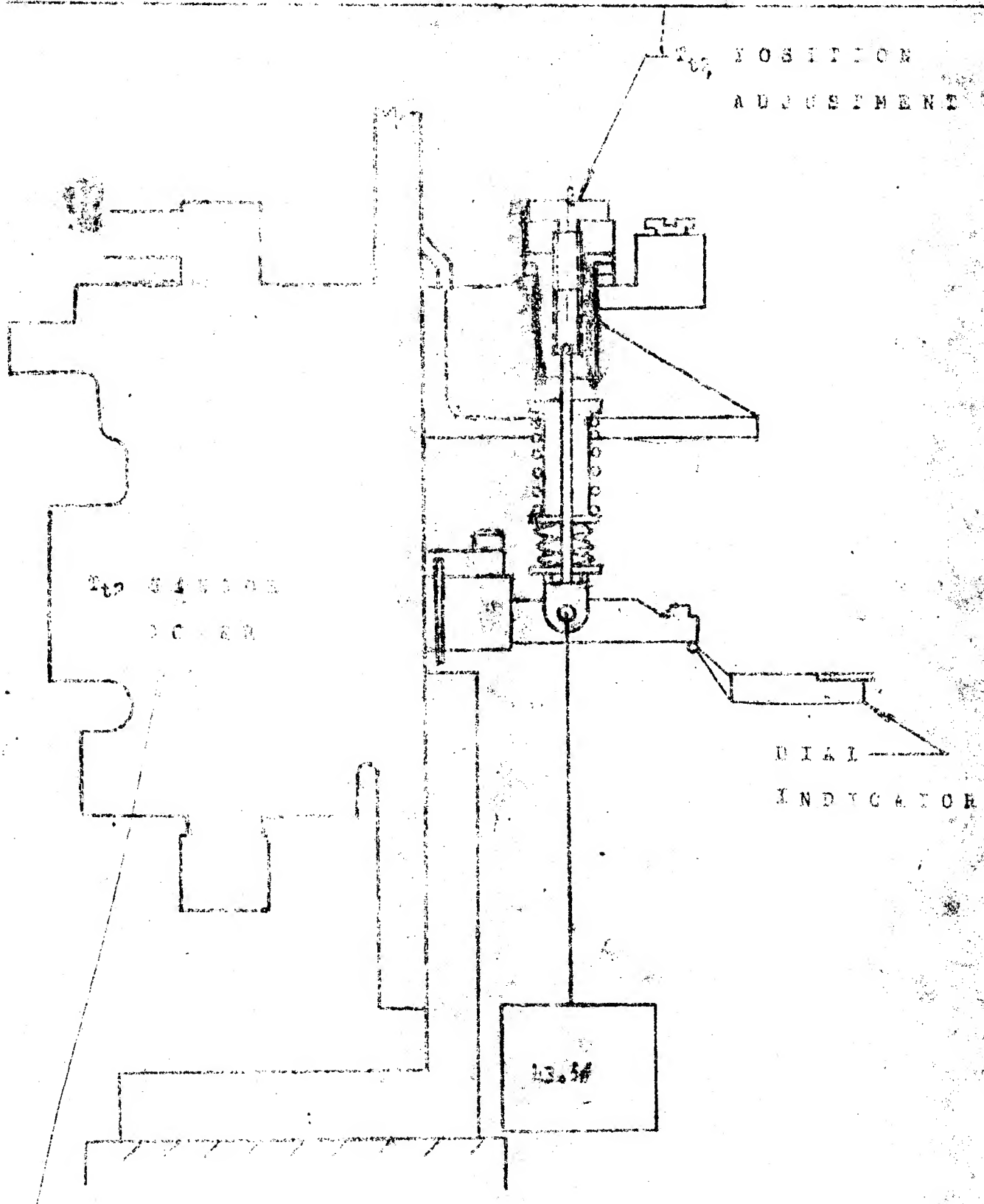


FIGURE 2.

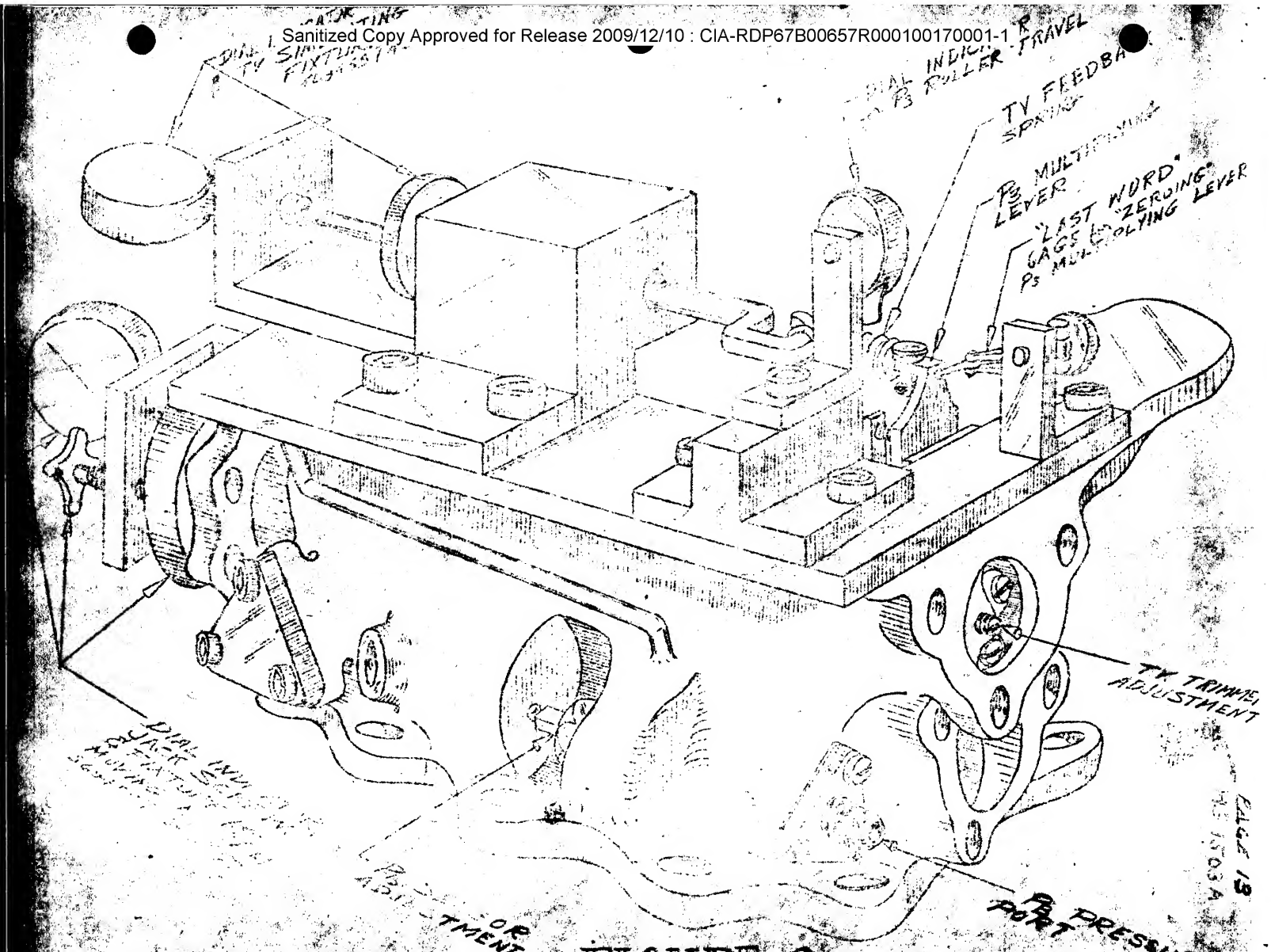


FIGURE 2.

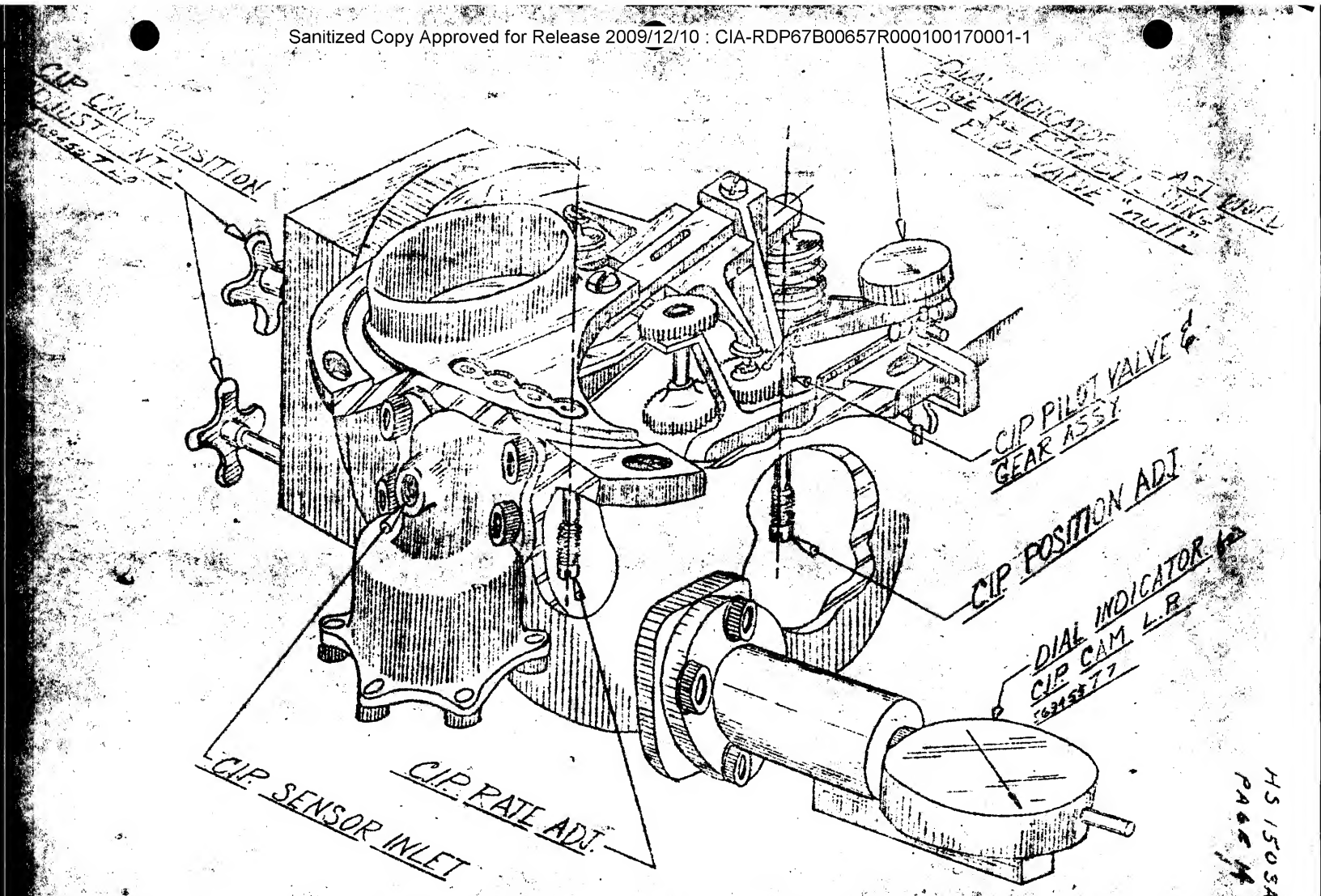


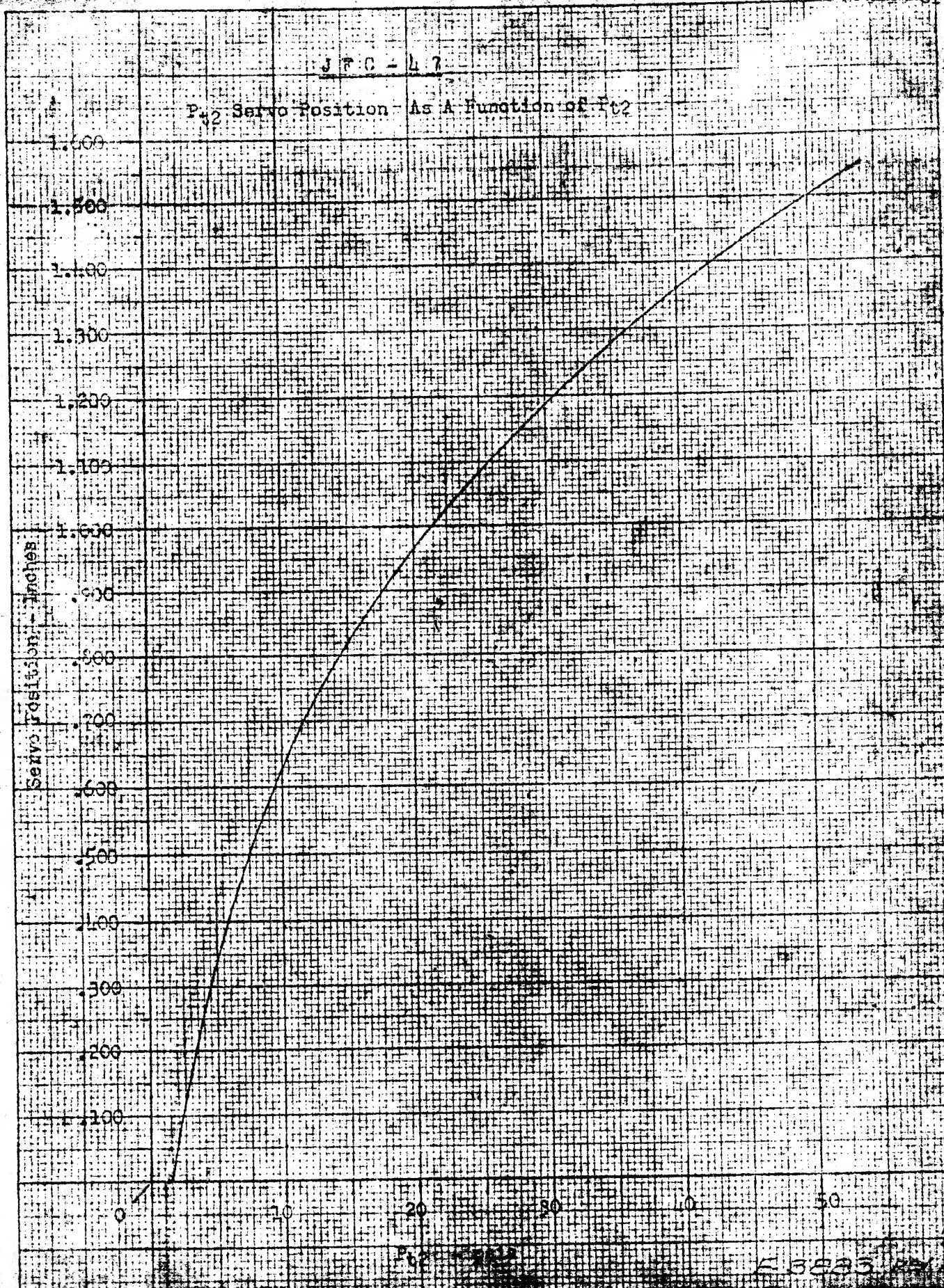
FIGURE 3.

HS 150SA
PAGE 14

HS 150-3A

JFC - 47

P_{42} Servo Position As A Function of T_{c2}



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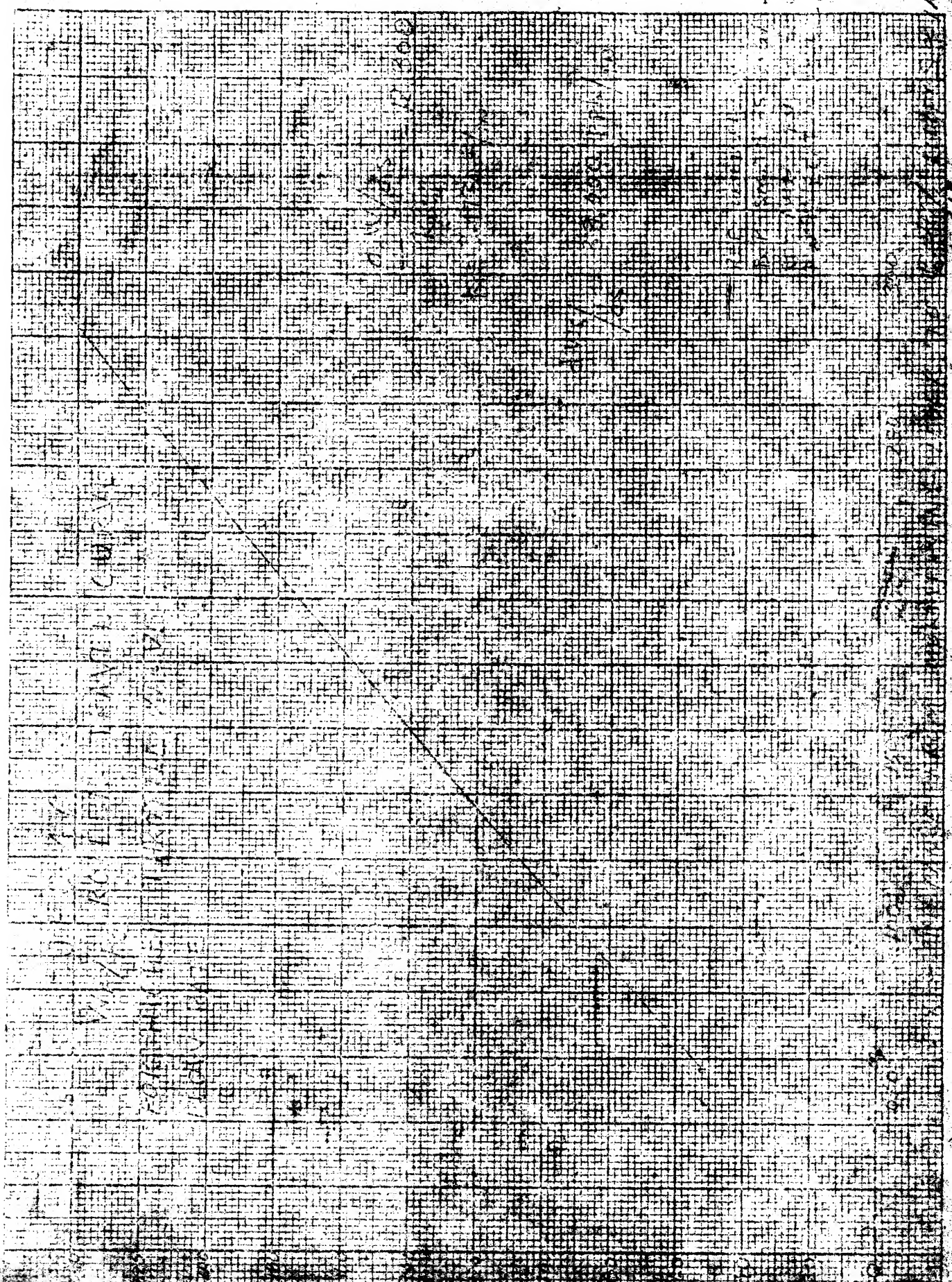

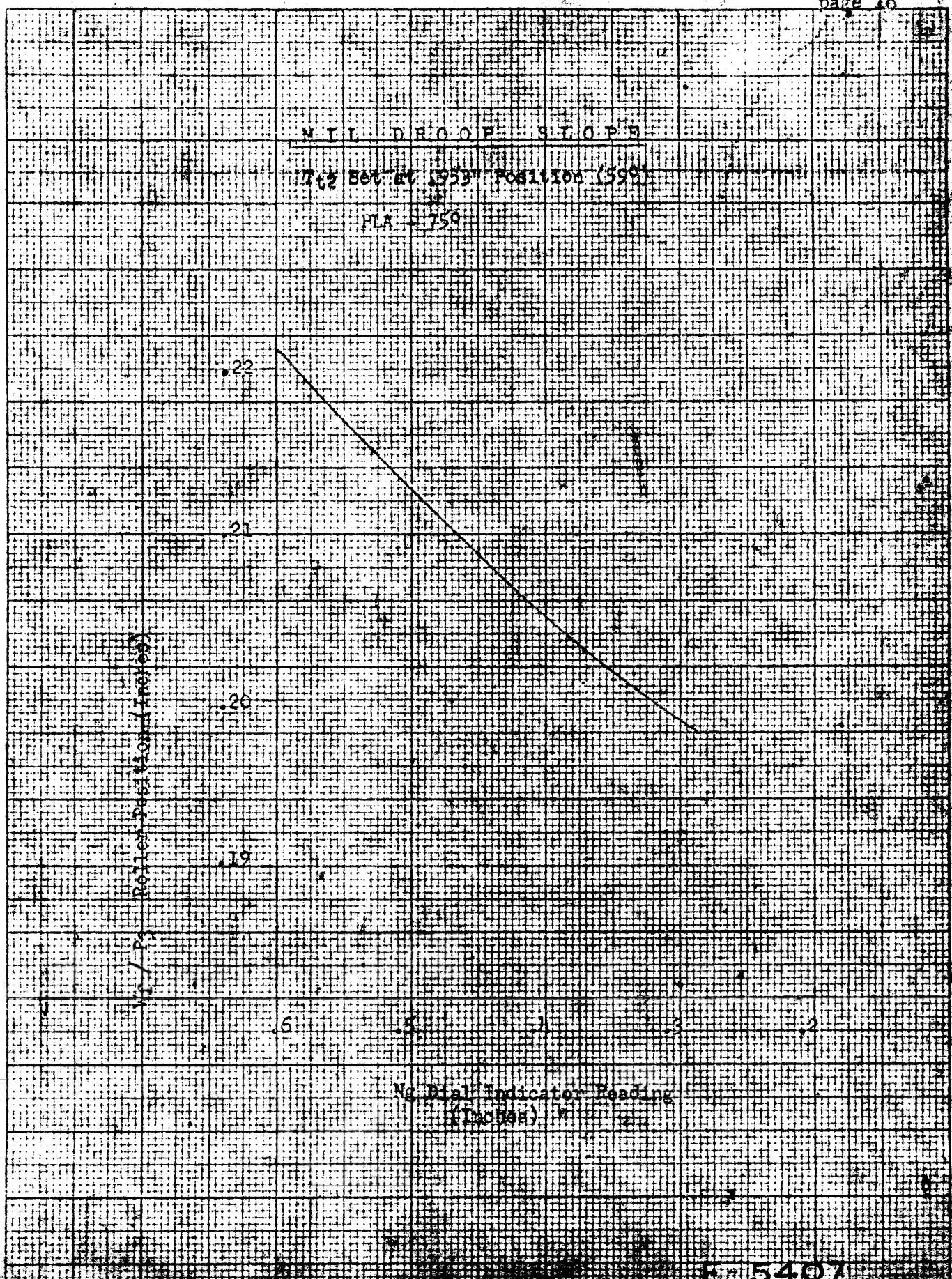

HAMILTON STANDARD
DIVISION OF UNITED AIRCRAFT CORPORATION
WINDSOR LOCKS, CONNECTICUT

H.S. 1503 A
Amend. 1
Page 1 of 2
E.C. 73182
Date: 8-10-62

H.S. 1503 A "Dry Calibration JFC 47 Main Control"

Amendment 1

1. Add Paragraph 1.1.1 as follows:

For purposes of this specification, controls are grouped as follows:

Group I	X Controls (Including Xcrm)
Group II	Y Controls (Production Units #12,13)
Group III	Y Controls (#14 P.U. & Subsequent)

2. Change Paragraph 7.4.2 from:

7.4.2 Set PL at 75° - 120° and bring Ng servo from .800" position to .495" position and record Wf/P3 roller position.

To read:

7.4.2 Set PL at 75° - 120° and bring Ng servo from .800" position to .495" position and record Wf/P3 roller position. Call this Valve A.

3. Change Paragraph 7.4.4 from:

7.4.4 Bring Ng servo from .800" position to .495" position and record Wf/P3 roller position.

To read:

7.4.4 Bring Ng servo from .800" position to .495" position and record Wf/P3 roller position. Call this Valve B.

4. Change Paragraph 7.4.5 from:

7.4.5 The mid position between Para. 7.4.2 and 7.4.4 should be .213" roller position. is. $\frac{7.4.2 + 7.4.4}{2} = .213"$

To read:

7.4.5 Military trimmer must be shimmed such that $\frac{3A + B}{4}$ = .213 For Group I Controls
220 For Group II Controls
227 For Group III Controls

HAMILTON STANDARD
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WINDSOR LOCKS, CONNECTICUT

H.S. 1503A
Amend. 2
Page 1 of 1
E.C. AZ73323
Date: 8-22-62

H.S. 1503A "DRY CALIBRATION JFC47 MAIN CONTROL"

Amendment 2

1. In paragraph 7.4.2 change last sentence which reads "Call this Valve A" to read "Call this Valve B."

2. In paragraph 7.4.4 change last sentence which reads "Call this Valve B" to read "Call this Valve A."

H.S. 1503 A Dry Calibration JFC47 Main Control

Amendment 3

Amend as follows:

1. Delete paragraph 2.0 in its entirety.

2. Change Paragraph 6.0, Sequencing Operation, to Paragraph 4.0
Change Paragraph 4.0, Temperature Servo, to Paragraph 5.0
Change Paragraph 5.0, Min - Max Ratio Lines, to paragraph 6.0

3. Paragraph 6.7.
Change "200 psi" to read "250 psi".

Change Paragraph 6.9 to read:
Rotate PLA from 0° to 15° . . . . . in tabular form. Results shall fall within limits of Curve F5544.

4. Change Paragraph 7.4.2 to read:
Set PL at 75 - 120° and . . . . . roller position. Call this value B.

Change Paragraph 7.4.4 to read:
Bring Ng servo from . . . . . roller position. Call this value A.

Add the following:

9.0 Compressor Bleed Actuator (CBA)

9.1 Mount assembled CBA unit on fixture plate using rubber "O" seals. Use 75 - 125 in torque on screws.
9.2 Mount protractor fixture to CBA output shaft.
9.3 Attach supply line to component test rig and with P_1 & P_2 closed, set supply pressure to 50 psig.

9.4 Set valves as follows in the sequence shown:
1. Open P body
2. Open P2 drain
3. Close P1 drain
4. Open P1

9.5 Index protractor fixture to 0° position.

9.6 Set valves as follows in the sequence shown:
1. Close P1
2. Open P1 drain
3. Close P2 drain
4. Open P2

H.S. 1503 A Dry Calibration JFC47 Main Control

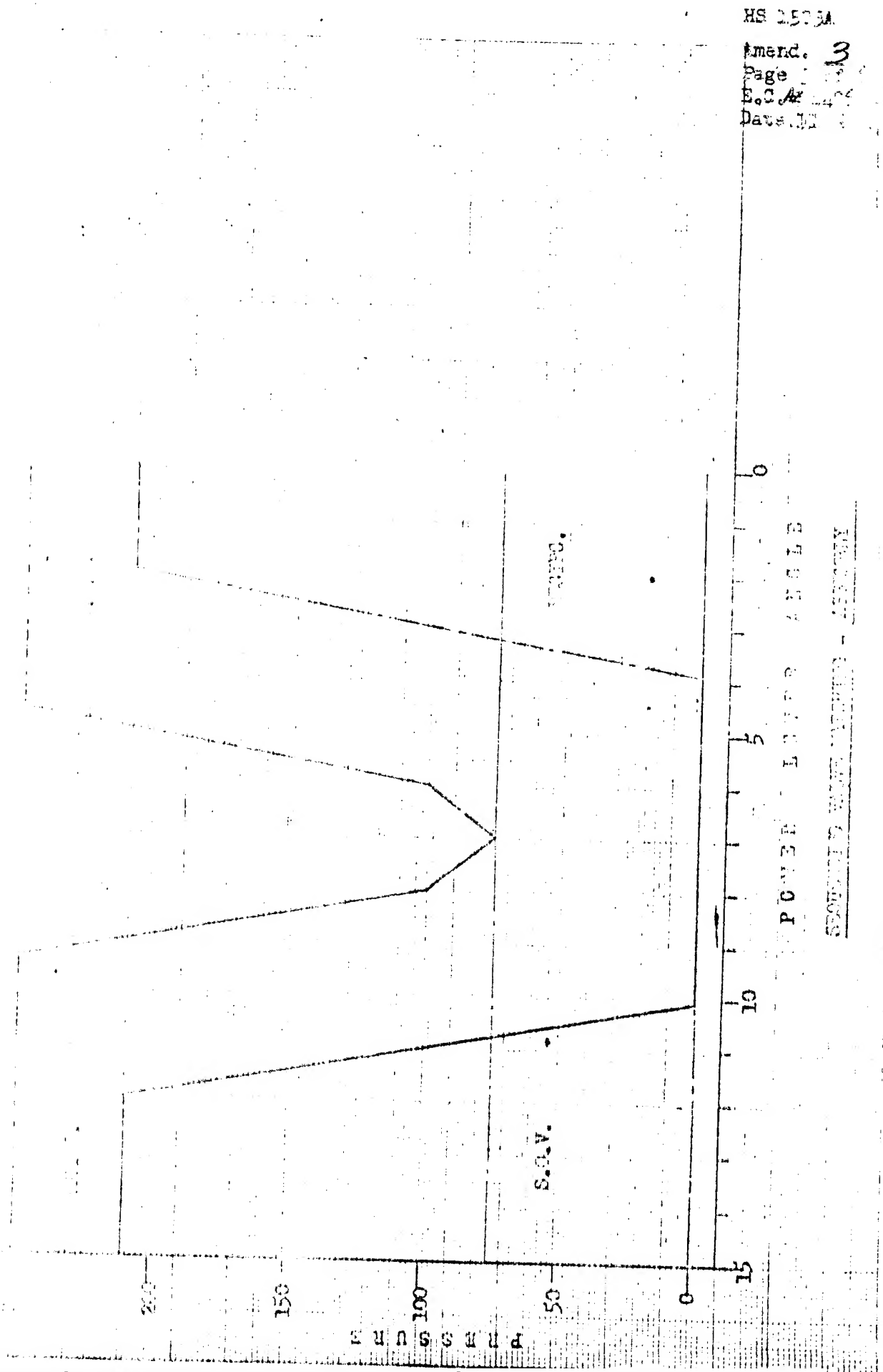
Amendment 3

9.7 Record protractor reading. Angular movement (hydraulically) shall be 30° to 35°. If not within limits check to see whether CBA piston length, piston bore depth, and piston cover stop length are within blueprint tolerances.

9.8 Close P1 drain valve and increase supply pressure to 200 psi. Slowly close P body valve until body pressure reaches 150 psi.

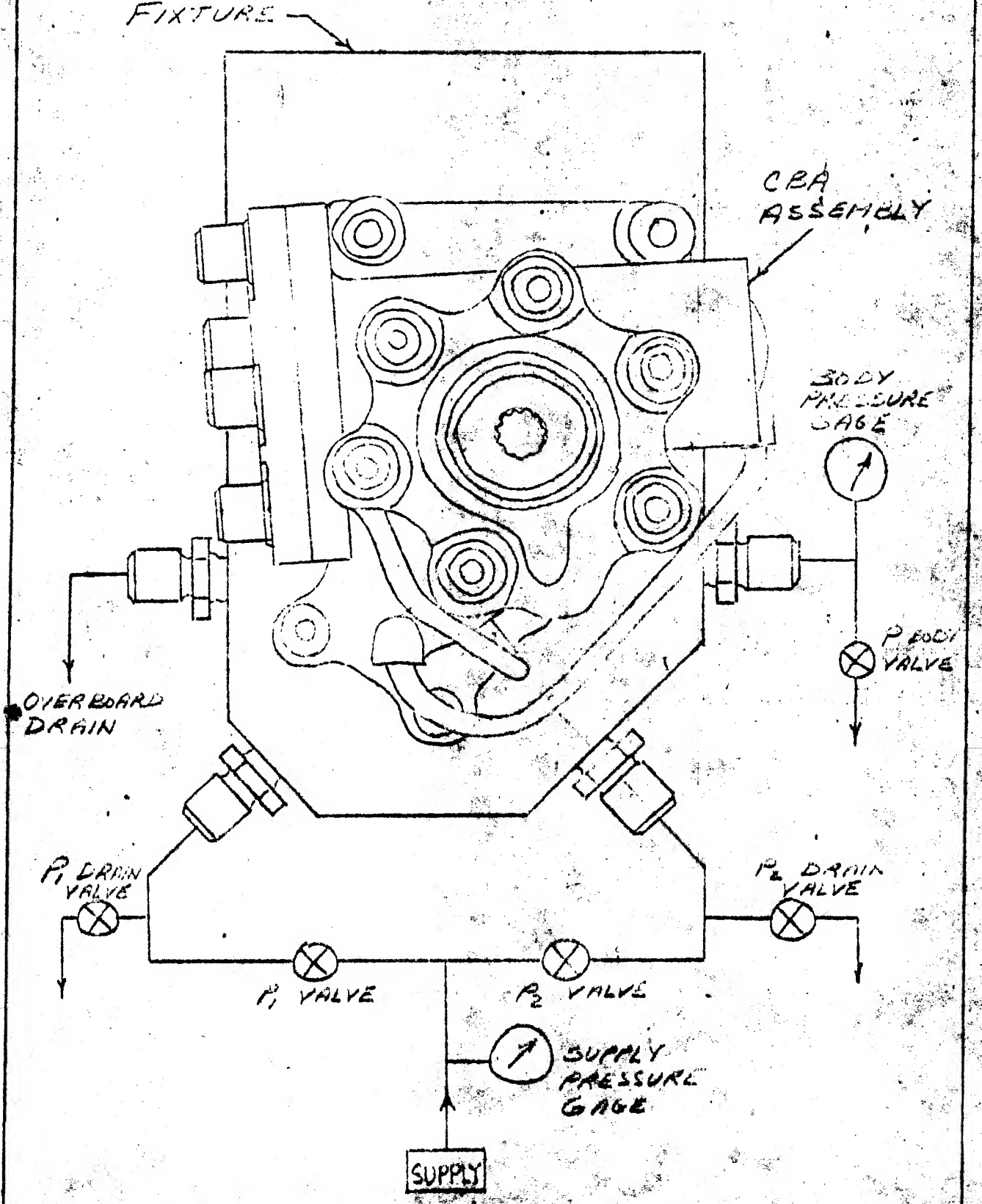
9.9 Measure overboard drain leakage. Leakage shall be no greater than 5 drops per minute. If leakage exceeds this amount, check face of carbon seal and lap if necessary.

10.0 Shut off supply pressure and open body pressure and drain valves. Remove unit from fixture.



HAMILTON STANDARD

B.C. TM406
Date: 13/8/62



CBA TEST SETUP

H.S. 1503 A " Dry Calibration JFC 47 Main Control"

Amendment 1

5. Change Paragraph 7.4.5.1 from:

7.4.5.1 If the roller position, as determined in Para. 7.4.5 is less than .213", remove shims from Military Trim Push Rod.

To read:

7.4.5.1 If the roller position, as determined in Para. 7.4.5 is less than vlave in table, remove shims from Military Trim Push Rod.

6. Change Para. 7.6.4.1 from:

7.6.4.1 Move Ng servo from .800" position to .495". Roller position should be .193" or less.

To read:

7.6.4.1 Move Ng servo from .800" position to .495". Roller position should be E or less.

7. Change Para. 7.6.5 from:

7.6.5 Rotate Military Trimmer within 5 clicks of full clockwise and move Ng servo from .800" to .495" position. Rollers should be at .241 or more position.

To read:

7.6.5 Rotate Military Trimmer within 5 clicks of full clockwise and move Ng servo from .800" to .495" position. Rollers should be at F or more position.

	E	F
For Group I Controls	.176	.224
Group II Controls	.184	.232
Group III Controls	.190	.240

H.S. 1503A Dry Calibration JF047 Main Control

Amendment 3

10.0 CDP LIMITER

10.1 Install CDP Limiter sub assembly into CDP Limiter dry calibration fixture 569435-T-139, using 4 screws.

10.2 Install inlet and outlet lines to limiter with a 200 psi Heise gage in each line.

10.3 Supply air at 180 psia to inlet, and read corresponding outlet pressure on outlet gage.

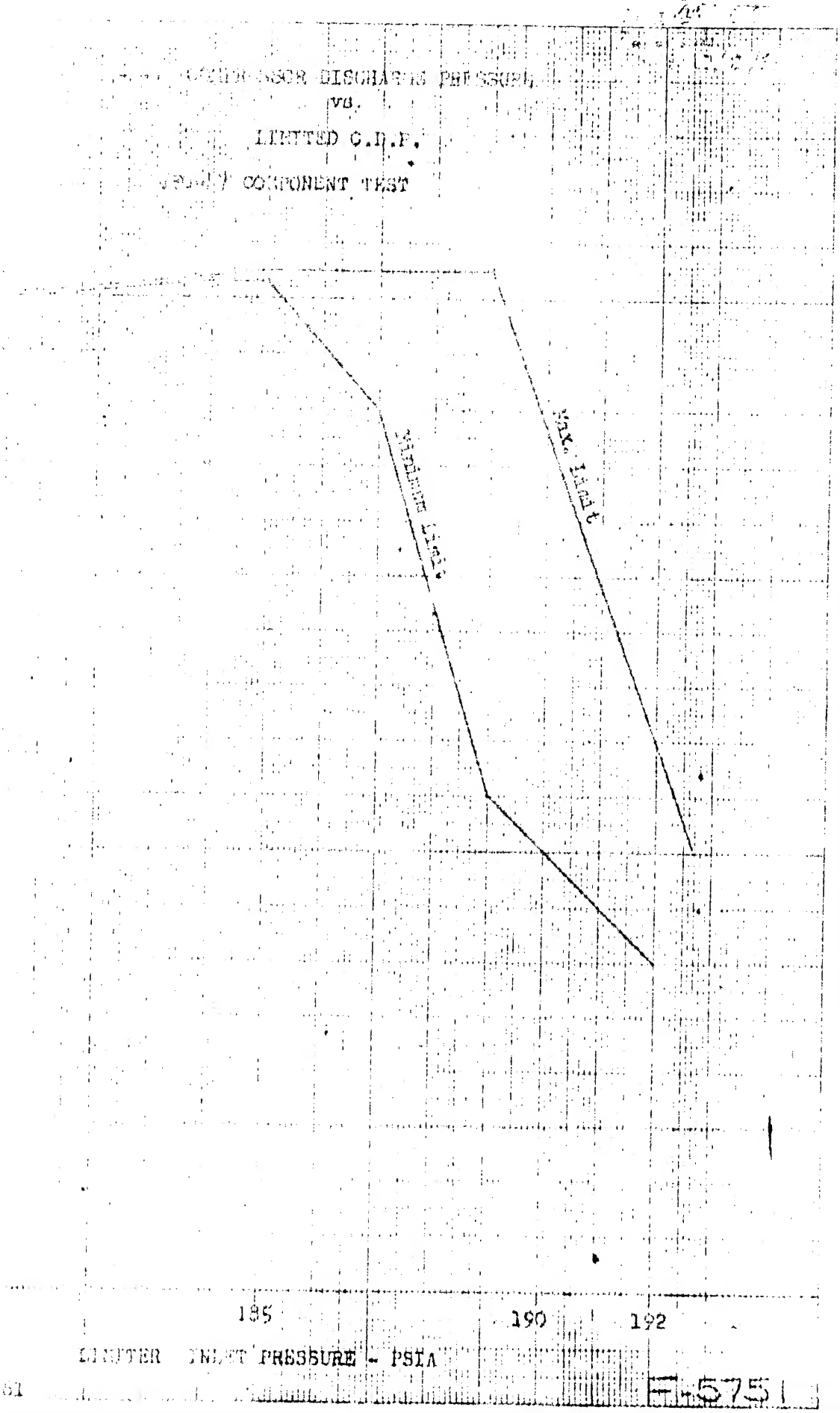
10.4 Continue to increase inlet pressure in 1.0 psi increments recording the corresponding outlet pressure at each point.

10.5 Outlet pressures shall fall within the limits of spec. curve.

10.6 If points are below limit, turn adjusting nut clockwise; if above, turn counterclockwise. Continue adjusting until limits of paragraph 5 are met.

10.7 No leakage before the cracking pressure is acceptable. (one indication of leakage is when the outlet pressure does not equal the inlet pressure at values of 184 psia and below).

10.8 After final calibration insert locking key into shaft and lockwire key to hexagon nut.



J P C - 4 7

Temp. Servo Calibration

Simulator Pressure

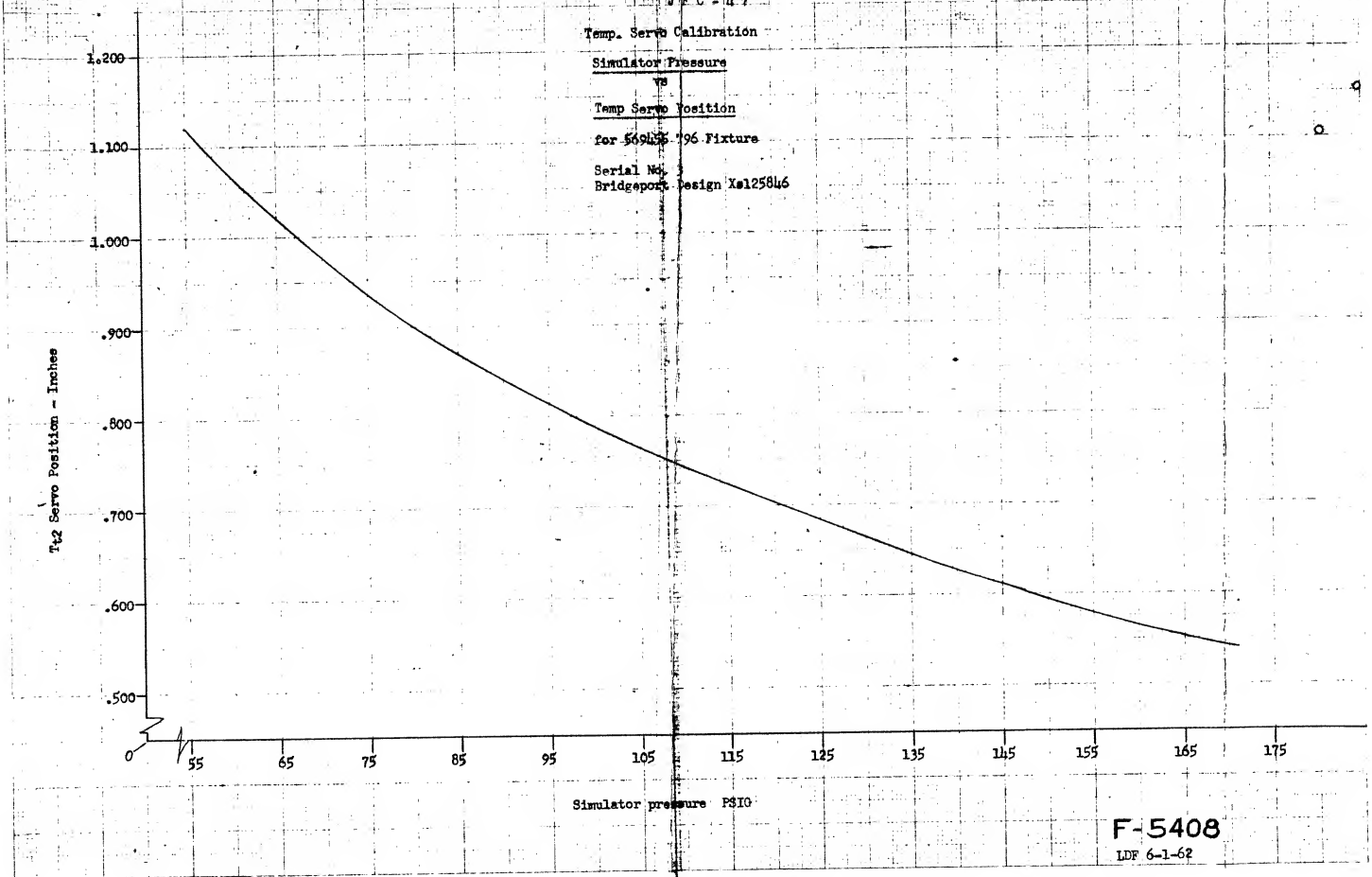
vs

Temp Servo Position

for 569475-796 Fixture

Serial No. 3

Bridgeport Design Xs125846



F-5408

LDF 6-1-62

1.0 SCOPE

The purpose of this specification is to provide a leak test procedure for steel housings used on the JFC-47 exhaust nozzle control and regulator in order to insure detection of minute leaks. Under no circumstance does this specification apply to any other JFC-47 housing.

2.0 EQUIPMENT REQUIRED

2.1 A pressure test rig capable of maintaining 5750±50 psi for 15 minutes under seepage conditions.

2.2 Pressure gages.

High pressure 0-6000 psig - 1% Accuracy.
Low pressure 0-500 psig - 1% Accuracy.

2.3 Suitable fixtures to apply pressure to the high pressure area, as specified on the applicable blueprint, and to bleed air from the area being tested.

2.4 Suitable fixtures to apply pressure to the low pressure area, as specified on the applicable blueprint, and to bleed air from the area being tested.

3.0 TEST FLUID

Test fluid shall be MIL F-7024A, type II corrosion inhibted demineralized water (potassium dichromate, .1% - .2% by weight.)

4.0 DEFINITION OF EXTERNAL LEAKAGE

With the required pressure applied to the designated portion of the housing, remove all traces of fluid from the exterior surfaces. The term "no leakage" shall be defined as no appearance of fluid on the external surface of a housing, including no seepage or wetting on the surface, regardless of the fact that fluid does not run off the surface of the housing or forms droplets.

5.0 METHOD OF TEST

5.1.0 Leak test of high pressure area.

5.1.1 Install suitable fixtures to pressurize the high pressure area of the housing as designated by the blueprint. Apply pressure and bleed air from this area. Increase pressure to 5750 ± 50 psig and hold for 5 minutes.

5.1.2 Cycle pressure from 1000psig 4000 psig 50 times. Time required to increase pressure from zero to 4000 psig should be 35 to 12 seconds for each cycle.

5.1.3 Apply 5750 ± 50 psig in high pressure area and hold for 15 minutes. There shall be no external leakage during this time.

5.2.0 Leak test of low pressure area.

5.2.1 Install suitable fixtures to pressurize the low pressure area of the housing as designated by the blueprint. Apply pressure and bleed air from this area. Increase pressure to 320 ± 20 psi and hold for 5 minutes.

5.2.2 Cycle pressure from 100 to 250 psig 50 times. Time required to increase pressure from zero to 250 psig should be 5 - 12 seconds for each cycle.

5.2.3 Apply 320 ± 20 psig in low pressure area and hold for 15 minutes. There shall be no external leakage during this time.

1.0 SCOPE

This specification describes the phases of assembly which are not included on the appropriate assembly drawing of the Bypass and Shut-Off Valve, 576497.

2.0 DESCRIPTION

This unit consists essentially of a dump valve and sleeve, a shut-off valve and sleeve, a recirculating valve and sleeve and a housing. Each valve is spring loaded and shim adjusted. It is located downstream of the main fuel control. The operation of the unit is dependent on the position of the sequencing valve which, in turn, is positioned in accordance with power lever angle.

3.0 EQUIPMENT REQUIRED

No special tools are required.

4.0 ASSEMBLY PROCEDURE

4.1 Cleanliness of Parts

All parts must be kept free of dirt, dust, grit and other foreign matter.

4.2 Assembly of Check and Dump Valve

4.2.1 Assemble one (1) shim 520128, washer 571398, and spring 583422 into the housing and piston set 583487.

4.2.2. Install shims 569669 under the packing 560006 to reduce the clearance between the packing and the cover and tubes assembly 580825 to .000-.002. The thickness of shims can be found by the following procedure:

A - Lay the packing 560006 in the housing.
B - Measure the distance from the flange parting surface to the packing.
C - Measure the distance from the flange surface of the cover and tubes assembly 580825 to the packing sealing surface and add .001.
D - Subtract dimension C from dimension B and the remainder should be the thickness of shims required (ref. Fig. 1).

Remove the packing 560006 and install the required thickness of shims. Install the packing 560006 on the shims and gasket 69397A30 at the parting surfaces of the housing and piston.

4.2.3 Assemble washer 571397 to cover and tubes assembly 580825. Install cover and tubes assembly 580825. Install cover and tubes assembly to the housing using two (2) bolts 69408B25-15 and six (6) bolts 69408B25-7 per the print 576497.

4.2.4 Torque each bolt to 125-135 in. lb. and secure with lockwire MS20995N32.

4.3 Assembly of Recirculating Valve

4.3.1 This valve is located between the dump valve and the minimum pressure and shut-off valve as shown on the assembly drawing 576497. To determine the thickness of shims 569669 required to obtain a .000-.002 clearance between the seal retainer 558905 and the parting surface of housing, measure and record the dimension between the packing 583488 and the parting surface of the housing (ref. Fig. 2). Subtrace from this dimension the distance from the cover flange surface to the seal retainer mating surface on the cover 558904.

4.3.2 Assemble two (2) rotating rings 575577, from (4) gaskets 69588B58, and (2) packings 69587A-58 in the housing, piston and valves set 583487 (Ref Fig 3). Measure and record the total height of the sleeve, from the packing 583488, sealing stack, and the length of the seal retainer 558905. Subtract the sum of the above dimensions plus .001 from the dimension obtained in paragraph 4.3.1. The remainder will be the thickness of shims 569669 required.

4.3.3 Assemble the sealing stack with the thickness of shims 569669 as determined above in the housing, piston and valves set 583487. Install seal retainer 558905 into the housing and then carefully install piston to avoid damage to the chevron seal.

4.3.4 With ths piston 583488 in a fully downward position, install .060" of shim 520128, spring retainer 571403, and helical springs 579202 and 579203 into the bore of housing, piston and valves set 583487.

4.3.5 Assemble spring retainer 571403 on top of the helical springs and assemble gasket 69397A32 to the housing. Install cover 558904 to the housing using five (5) attaching bolts 69408B25-9.

4.3.6 Torque each bolt to 125-135 in. lbs and safety with lockwire MS20995N32.

4.3.7 Install name plate 69444B4 using two (2) screws 69415-0-4.

4.4 Assembly of Minimum Pressure and Shut-off Valve

4.4.1 Assemble the minimum pressure and shut-off valve by repeating paragraphs 4.3.1 through 4.3.6.

5.0 Preservation and Storage

5.1 After completion of testing, the bypass and shutoff valve shall be drained of fuel and prepared for storage in accordance with HS Spec. 1613. Suitable covers shall be used to prevent damage or contamination of the assembly.

6.0 Preparation For Shipping

The unit shall be completely free of internal and external foreign material at the time of packaging and during shipping. All ports shall be capped with suitable plastic caps or their equivalent.

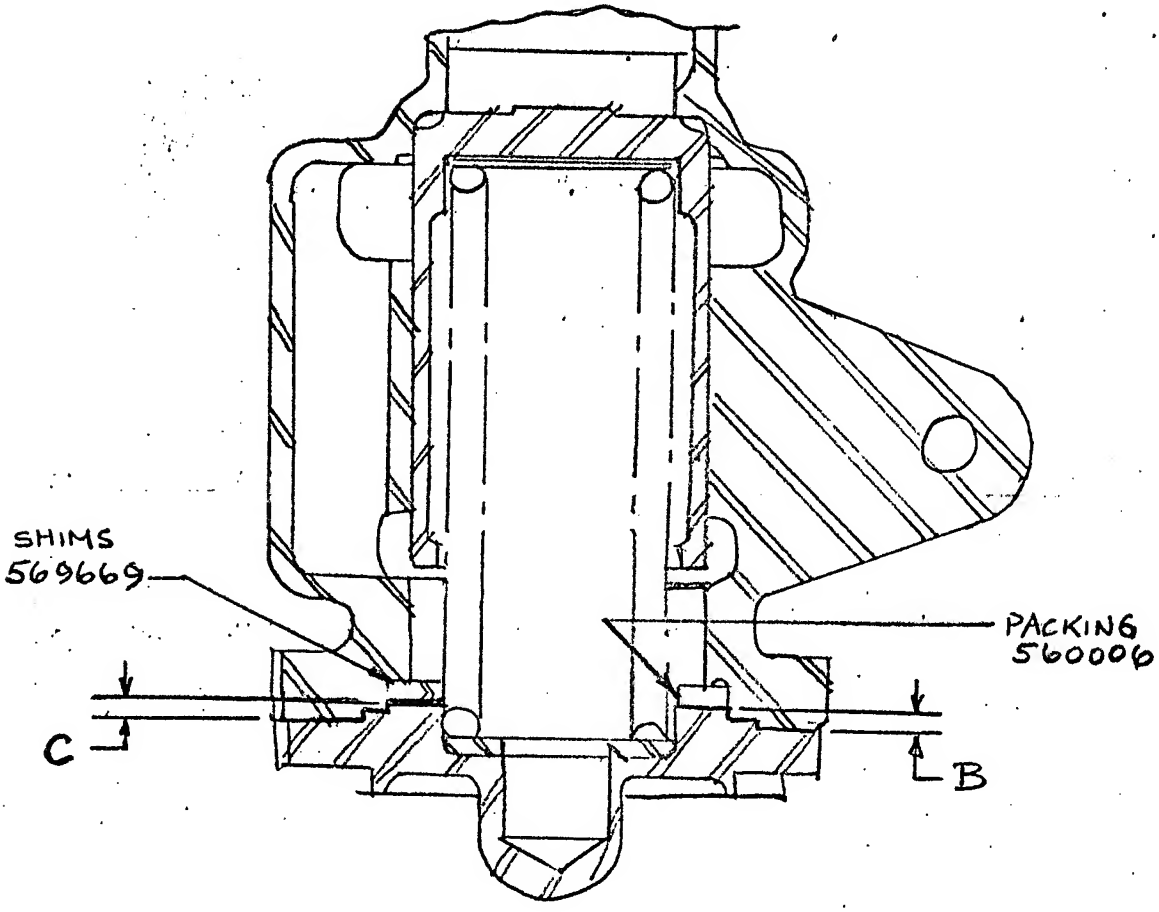


Figure 1

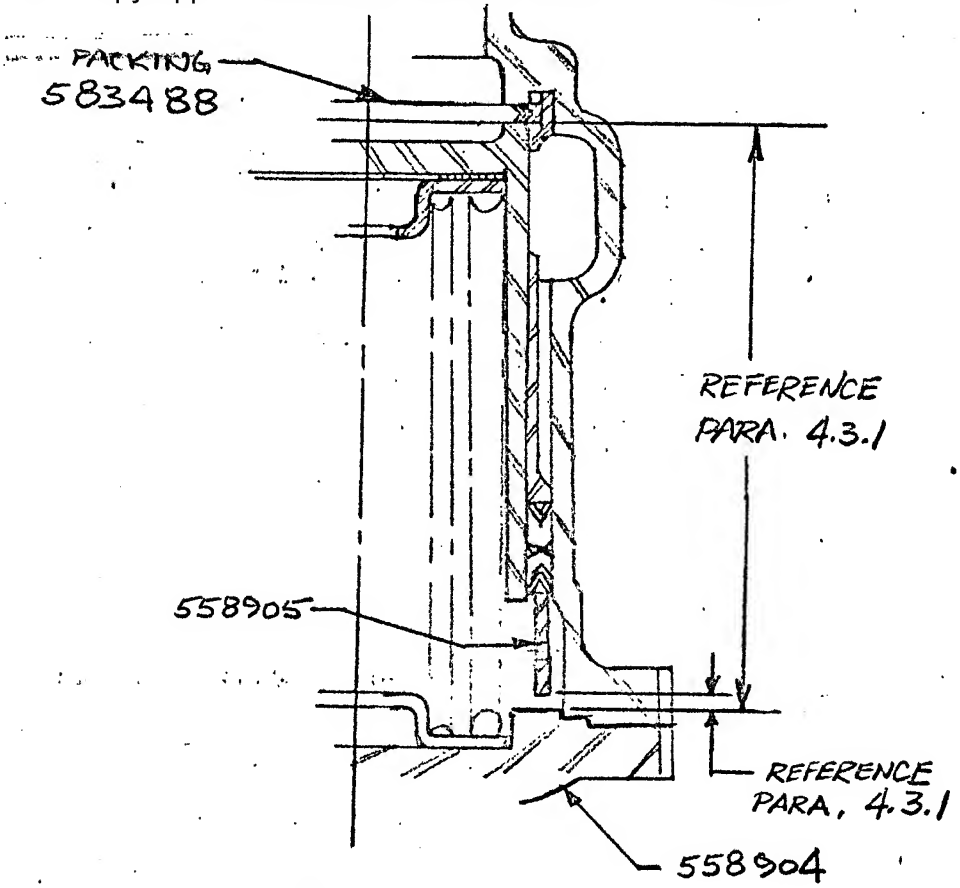


Figure 2

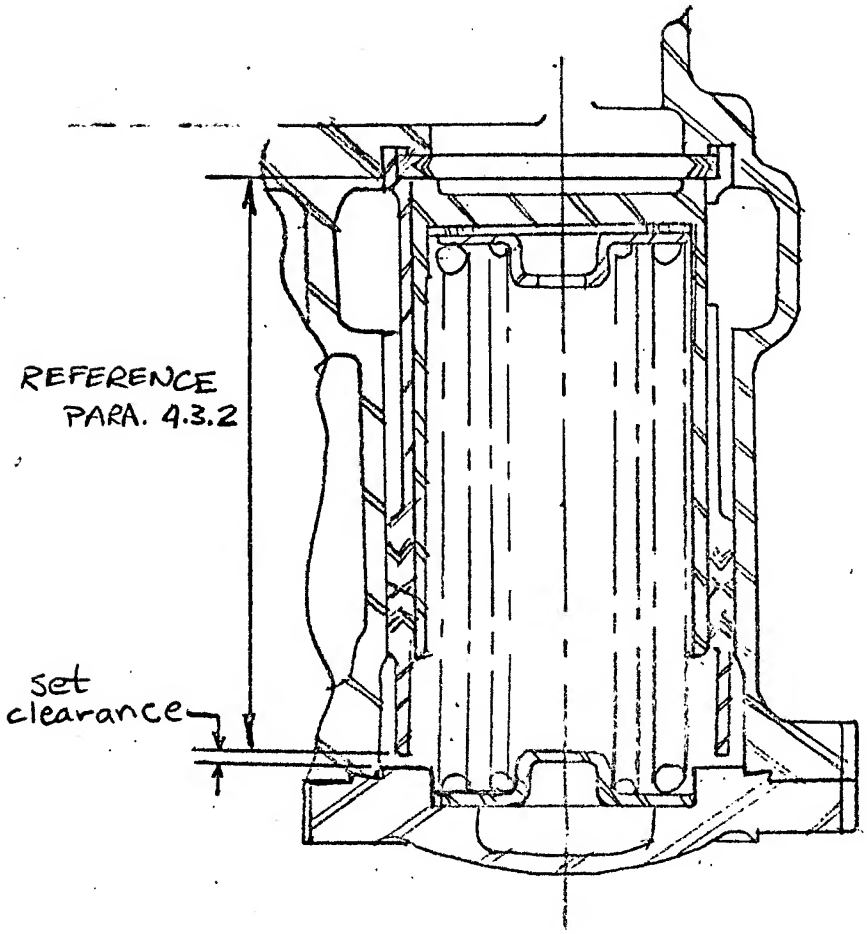


Figure 3

1.0 SCOPE

This specification defines the quality, performance and design requirements for a device for remote trimming of a fuel adjustment on an airborne fuel control used on a gas turbine engine.

2.0 APPLICABLE SPECIFICATIONS AND PUBLICATIONS

The following specifications and publications shall form a part of this specification. In case of conflict between the referenced documents and this specification, the provisions of this specification shall apply:

MIL-D5028 - Drawings and Data Lists, Preparation of

MIL-E-5007B - Engines, Aircraft, Turbojet, General Spec for

MIL-S-7742 - Screw Threads, Standard Aeronautical

MIL-E-5272C - Environmental Testing, Aeronautical and Associated equipment, General Spec for

MIL-W-3611 - Welding - Fusion, of Steels and Corrosion and Heat Resisting Alloys, Processes for

MIL-P-116 - Preservation, Methods of

MIL-I-8500 - Interchangeability and Replaceability of Component Parts for Aircraft.

MIL-E-5009B - Engines, Turbojet, Qualification Testing of

HS178 - Specification for Corrosion Resistant Steel Parts

HS191 - Fusion Welding

HS782 - Brazing - Hydrogen, Nickel Base Brazing Alloys

USAF Bulletin No. 23 - Materials and Process Spec.

ANA Bulletin No. 143 - Specification and Standards, Use of

ANA Bulletin No. 147 - Non-Government Agency Specifications

ANC-5 - Strength of Aircraft Elements

HSD Drawing #567085 - Housing and Inserts, Servo

3.0 DESCRIPTION

The remote trimmer shall consist of a package with externally available Idle Trimmer Screw for ground adjustment, and electrically operated Military trimmer screw for in-flight adjustment, with mounting pad. In addition, the Mil speed shall be capable of ground adjustment with test stand hardware without removal of the unit from the control and while the control is pressurized.

4.0 DESIGN

It shall be the goal of the design to be capable of successfully completing a component qualification test as outlined in the following paragraphs of the respective military specifications:

MIL-E-5009B

4.3.3.3.3 - Explosion Proof Test

4.3.3.3.6 - Inlet Test

MIL-E-5400

4.6.7 - Temperature Shock Test

4.6.8 - Humidity Test

4.6.2 - Salt Spray Test

4.7.12 - Vibration Test. In addition, the unit shall be vibrated for 1 hour in each plane at a frequency of 125 cps and an acceleration of 10 g's.

4.8 - Fungus Test - if fungi nutrient materials have been used in construction.

4.11.3 - Sand and Dust Test

4.1.1 Component qualification test mentioned above is to be performed by the vendor where requested by separate purchase order.

4.1.2 Component redesign and retest shall be required at vendor's expense in the event of any failure of the unit undergoing the above mentioned tests.

4.2 The design shall meet the envelope requirements of the applicable Hamilton Standard drawing which will not be subject to change without vendor approval.

4.3 Standards, Materials and Workmanship

4.3.1 Standard Parts

AN and MS standard parts and corresponding AN and MS part numbers, shall be used wherever suitable for the purpose. Commercial quality, or vendor designed standard parts, such as screws, nuts, bolts, washers, etc. may be used provided they are replaceable by AN and MS standard parts without alteration.

4.3.2 Materials

The materials used in this unit shall be of high quality, shall be compatible with P&WA 523, JP-5, JR150 or RJ-1 fuel under conditions specified in paragraphs 5.5.4, 5.5.7 and 5.5.9 and shall not be adversely affected when placed in a radiation field. The use of AMS 5620, 5621, 5630, 5631, and 5632 stainless steels and metals containing silver, copper, or cadmium which shall be in contact with fuel are prohibited without written authority from Hamilton Standard.

4.3.3 Workmanship

The workmanship and finish on all parts shall be in accordance with high grade manufacturing practices covering this type of aircraft equipment.

4.4 Data Plate

A data plate shall be attached to the unit and shall include the following information:

(a) Manufacturer's name and trademark

(b) Manufacturer's serial number

(c) Manufacturer's patent and/or patent pending information

(d) Manufacturer's part number

4.5 Mockup

4.5.1 A mockup of the remote trimmer shall be supplied to Hamilton Standard and submitted for approval of the engine manufacture.

4.5.2 The mockup shall be kept current with approved changes affecting the external configuration of the unit or its installation.

4.6 Drawings

The remote trimmer manufacturer furnish the following drawings to Hamilton Standard prior to fabrication of any items of the assembly:

(a) Installation drawings

(b) Schematics (if applicable)

(c) Detail drawings (full set)

4.7 Interchangeability

4.7.1 All parts of equipment components having the same part numbers shall be interchangeable or replaceable in accordance with, and to the extent required by MIL-D-5128, and shall be manufactured in conformity with the provision of such specification.

4.7.2 Changes in design, dimensioning, or material that might affect interchangeability or performance of the unit shall be approved by Hamilton Standard prior to incorporation by the manufacturer.

4.8 Construction

The units shall be designed and constructed so that no parts work loose in service, and shall be built to withstand the strains, jars, vibration, and other conditions incident to shipping, storage, installation and service. Unless otherwise specified, all screw threads shall be in accordance with MIL-S-7742.

4.9 Processes

4.9.1 Welding

Weld construction is permissible. All welding shall be in accordance with MIL-W-8611 per HS 191.

4.9.2 Brazing

Brazed construction is permissible and shall comply with HS 782.

4.10 Handbooks and Instructions

When requested under separate purchase order, the vendor shall furnish to the purchaser:

(a) Technical orders

(b) Overhaul and maintenance handbook

(c) Illustrated parts breakdown.

4.11 Development

The vendor shall agree to replace, without cost to Hamilton Standard, all defective parts of the first two delivered units, or parts whose failure could be attributed to a defect in any operational function of the same units. In addition, he shall agree to give Hamilton Standard the right to return, at no expense, all units which do not meet this specification in its entirety.

4.12 Engineering Changes

4.12.1 Definitions

4.12.1.1 Class I Changes

A Class I change shall be defined as a change in which any one of the following apply:

(a) Model specification, control specification, control price, weight or delivery is affected.

(b) Performance or durability is affected to such an extent that superseded parts, sub-assemblies, complete articles or complete assemblies must be reworked, replaced or discarded in service at or before the next overhaul.

(c) The design change is recommended for any retrofit to delivered articles.

(d) Complete interchangeability of installation or performance of the end item, or the complete component on the end item is affected.

(e) Parts, sub-assemblies, or complete assemblies replaceable by the user are affected to such an extent that the superseded and superseding parts, sub-assemblies or complete assemblies are not directly and completely interchangeable with respect to installation or performance.

4.12.1.2 Class II Changes

A Class II change shall be defined as minor changes not affecting the articles or detail parts in the manner outlined in 4.12.1.1 above.

4.12.2 Identification

4.12.2.1 Detail Part Numbers

The part number identification shall be changed on all parts and sub-assemblies affected by a Class I change.

4.12.2.2 Assembly Numbers

The assembly number of the vendor's end item shall only be changed on a Class I change that affects the end item interchangeability with respect to installation and/or performance, and on any change requiring retrofit at or before next scheduled overhaul.

4.12.2.3 Data Plate

The data plate will indicate the incorporation of all Class I change by a prefix or suffix revision to the vendor's end item part number or parts list number.

4.12.3 Approvals

4.12.3.1 Class I Changes

Official authorization must be obtained from Hamilton Standard Purchasing Department prior to shipment of units incorporating a class I change. Authorization by Hamilton Standard will be based on Pratt and Whitney Aircraft approval of the change proposal. Requests for such approval should be submitted to the Hamilton Standard Purchasing Department in the form of Engineering Change Proposals. Firm copies of each proposal must be submitted. The proposal is to include the following:

(a) Drawings and parts lists to define the change

(b) An add and cancel list

(c) An indication of saleable and repairable items.

(d) The estimated incorporation date

(e) The applicable cost and change in price

4.12.3.2 Class II Changes

Hamilton Standard approval is not required for the incorporation of Class II changes, except that all specification changes must be coordinated with Hamilton Standard Engineering. Copies of all Class II changes with applicable revised drawings must be sent to Hamilton Standard for review after publication.

5.0 Detail Requirements

5.1 Weight

The weight of the complete remote trimmer package shall not exceed 7.0 pounds. This weight shall be considered a maximum limit and not a target value. The final weight of the package must be justified.

5.2 Assembly Limitations

The unit shall be so assembled that it requires no brazing at overhaul.

5.3 Envelope and Installation Details

The configuration, dimension, and mounting shall comply with applicable H.S.D. drawings.

5.4 Life

5.4.1 The unit shall be designed for an engine operating life of 1000 hours under normal service conditions prior to overhaul.

5.4.2 The casting life expectancy shall be 10,000 hours.

5.5 Functional Requirements

5.5.1 Adjustments

5.5.1.1 The military adjustment shall be so designed that it will have a total adjustment range of not less than 10 turns, of which only 5 turns shall be available to the pilot for trim in-flight.

5.5.1.2 The Mil and Idle adjustment must be accessible for trim on the ground with the remote trim device in place.

5.5.1.3 The rate of operation of the military adjustment of the remote trimmer shall be 1 ± 1/4 RPM at 400 cps power supply.

5.5.1.4 The normal operating and starting torque output shall be 5 inch-pounds and the device shall have a stall torque of 12-15 inch pounds.

5.5.1.5 The remote trim shall have adjustable limit stops capable of setting the operating stroke to within ¼ revolution of the desired valve. The unit shall also have the capability of locating the remote trim adjustment (nominally 5 revolutions) anywhere within the 11 revolutions of total adjustment with a position accuracy of ±5 degrees.

5.5.1.6 The unit shall be provided with a magnetic or mechanical brake to prevent rotation of the motor armature during power-off periods. The brake shall be capable of braking an input of 5 in-lbs.

5.5.2 Electrical Requirements

5.5.2.1 Power Supply

The actuator shall be capable of satisfactory operation when supplied with 208 ±5% VAC, 400±80 cps, 3 phase power.

5.5.2.2 Electrical Interference

The unit shall comply with electrical interference requirements per paragraph 3.11.2 of MIL-E-5007B. The compliance of the unit to this spec. shall be demonstrated by the vendor.

5.5.2.3 Duty Cycle

The duty cycle of the unit shall be 10 minutes on, 10 minutes off.

5.5.3 Fuel

The fuel supplied for cooling the unit shall be P&WA 523, however, fluids such as JP-6, JP-150, RJ-1, etc. should also be considered as possible fuels.

5.5.4 Fuel and Ambient Temperature Range

5.5.4.1 The unit shall be designed to operate satisfactorily with ambient air temperatures between -65°F and +1082°F, and fuel inlet temperatures between -65°F and +300°F.

5.5.4.2 The switch control assembly shall be designed to operate satisfactorily in an inhabitable environment. It shall be required to meet the temperature requirements of MIL-E-5272C procedure II for high temperature and procedure I for low temperature, the altitude requirements of MIL-E-5272C, and the vibration requirements of MIL-E-5272C procedure XII at room temperature.

5.5.5 Ambient Pressure

The ambient (nacelle) pressure range is from .34 to 20 psia.

5.5.6 Coolant Flow Rate

Fuel as specified in 5.5.3 may be supplied to the unit for purposes of lubricating and cooling the internal gearing. Coolant flow at the temperatures specified in 5.5.4 shall not exceed 100 PPH at 150 psi supply.

5.5.7 Fuel Pressure

Fuel shall be supplied to the unit at a pressure of 150-1000 psig and returned at a pressure of 5-165 psig. The differential between the supply and return pressures shall never be less than 145 psi. The unit shall be designed for and shall demonstrate capability of withstanding, without structural failure or external leakage, the following pressures acting singly or in conjunction in any combination:

		Fuel Temp.
Inlet Pressure	0 - 2200 psig	400°F
Inlet Pressure	0 - 1500 psig	500°F
Return Pressure	0 - 500 psig	500°F

The high pressure zone of the unit shall be capable of withstanding a proof pressure test of 1500 psig without permanent deformation or external leakage. The low pressure zone shall similarly be capable of withstanding a 300 psig proof test. The trimmer package shall provide the necessary orifice to limit the coolant flow rate as specified in 5.5.6.

5.5.8 Leakage

The external adjustments shall have a double seal with a vent to overboard drain in between. The maximum leakage to overboard drain shall not exceed 1 cc/min. There shall be no external leakage of the unit; that is, it must be drop-tight and exhibit no external wetting of the surface.

5.5.9 Fuel Contamination

The unit shall operate satisfactorily after fuel containing the following contaminant is passed through a 40 micron filter provided in the fuel control.

Fuel Contaminants

(before 40 micron filtration)

Contaminant	Particle Size	Quantity
Iron Oxide	0 - 5 microns	15.77 gm/1000 gal.
Iron Oxide	5 - 10 microns	.83 gm/1000 gal.
Sharp Silica Sand	40-50 mesh	.03 gm/1000 gal.
Sharp Silica Sand	50-100 mesh	.03 gm/1000 gal.
Prepared dirt conforming to A.C. Spark Plug Co. Part No. 1543637 (Coarse Arizona Road Dust)	0-5 microns 5-10 microns 10-20 microns 20-40 microns 40-80 microns 80-200 microns	.53 gm/1000 gal. .53 gm/1000 gal. .62 gm/1000 gal. 1.02 gm/1000 gal. .07 gm/1000 gal. .02 gm/1000 gal.
U.S. Standard Staple No. 7 prime cotton linters	As ground in a No. 4 Wiley Mill and screened through a 4 mm screen.	.55 gm/1000 gal.
Crude Naphthenic Acid		.03% by vol.
Salt Water in accordance with salt spray solution per MIL-E-5272		.01% entrained

NOTE: The 40 micron filter will filter out approximately 45% of the particles under 40 microns in size and 97% of the particles over 40 microns. If a filter finer than 40 microns is required, it shall be a part of the remote trimmer package.

6.0 QUALITY CONTROL

The inspection tests listed below define the extent of responsibility of the Hamilton Standard Quality Control Department under this specification. Control shall be established to insure compliance with the following paragraphs of this specification:

6.0 QUALITY CONTROL (continued)

4.3.3 Workmanship

4.4 Processes

5.1 Weight

5.3 Envelope and Installation Details

5.5.1.3 Rate

5.5.1.4 Torque

5.5.6 Coolant Flow Rate

5.5.7 Fuel Pressure

5.5.8 Leakage

8.1 Cleaning

8.2 Packaging

7.0 ACCEPTANCE TESTS

An acceptance test of the remote trimmer shall be mutually agreed upon by the vendor and Hamilton Standard, and shall be subjected to final approval by the military service utilizing the engine. Ref. H.S. Spec 1350.

8.0 PACKAGING AND IDENTIFICATION FOR SHIPMENT

8.1 Cleaning

Each unit shall be thoroughly cleaned of dirt, sand, metal chips and all other foreign material during final assembly.

8.2 Packaging

The package shall be treated to insure protection against corrosion during shipment and storage in accordance with MIL-P-116.

8.3 All parts shall be covered to exclude dirt and threads protected to prevent them from damage.

8.4 All mounting faces shall be provided with temporary cover plates for protection from dirt and damage.

8.5 Each individual package shall be durable and legibly marked with the following information in such a manner that the markings will not become damaged when the package is opened:

(a) Name of apparatus

(b) Model designation

(c) Manufacturer's name or trademark

(d) Purchaser's order number

(e) Manufacturer's drawing number

(f) Manufacturer's serial number

HAMILTON STANDARD
DIVISION OF UNITED AIRCRAFT CORPORATION
WINDSOR LOCKS, CONNECTICUT

H.S. 1368
Amend. 1

ECNN65111
Date: 7-7-61

HS1368 "Procurement Specification for the JFC47 Fuel Adjustment Remote Trimmer"

Amendment 1

1. In paragraph 2.0 change:

MIL - D-5028	to	MIL-D-70327
MIL-S-7742	to	MIL-S-7742A (12-2-59)
MIL-W-8611	to	MIL-W-8611A
MIL-P-116	to	MIL-P-116C
MIL-I-8500	to	MIL-I-8500A

2. Change paragraph 4.1.2 to read:

"4.1.2 Component redesign and retest shall be required at vendor's expense in the event of any failure of the unit undergoing the above mentioned tests after completion of proof tests."

3. In paragraph 4.7.1 change "MIL-D-5028" to "MIL-D-70327".

4. In paragraph 4.9.1 change last sentence to read "All welding shall be in accordance with MIL-W-8611 or HS 191."

5. Change paragraph 4.11 to read:

"4.11 **Development**

The vendor shall agree to replace, without cost to Hamilton Standard, defective parts whose failure could be attributed to a defect in any operational function of the unit. In addition, he shall agree to give Hamilton Standard the right to return, at no expense, units which do not meet phase requirements in its entirety. (See detail B/P)."

6. In paragraph 5.1 change "7.0 pounds" to "7.2 pounds."

7. Change paragraph 5.5.1.2 to read:

"5.5.1.2 The manual Mil and Idle adjustment must be accessible for trim on the ground with the remote trim device in place and require not more than 45 in-lbs of torque for actuation."

HS1368 "Procurement Specification for the JFC47 Fuel Adjustment Remote Trimmer"

Amendment 1

8. In paragraph 5.5.2.2 change "MIL-E-5007B" to "MIL-I-6181D".

9. In paragraph 5.5.2.3 change "10 minutes on, 10 minutes off" to read "5 minutes on, 5 minutes off."

10. In paragraph 5.5.4.2 change the first sentence to read: "A switch control assembly, if provided, shall be designed to operate satisfactorily in an inhabitable environment."

11. Change paragraph 5.5.6 to read:

"5.5.6 Coolant Flow Rate

Fuel as specified in 5.5.3 may be supplied to the unit for purposes of lubricating and cooling the internal gearing. Coolant flow at 85 ± 10°F shall not exceed 100 PPH at 150 psi across the trimmer."

12. To paragraph 5.5.8 add the following sentence.

"Retorquing of seals at no less than 100 hours of operation is acceptable."

HAMILTON STANDARD
DIVISION OF UNITED AIRCRAFT CORPORATION
WINDSOR LOCKS, CONNECTICUT

H.S. 1368
Ammend. 2
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E.C. 65620
Date: 9-27-61

H. S. 1368 "Procurement Specification for the JFC47 Fuel Adjustment Remote Trimmer"

Amendment 2

1. In the 1st sentence of paragraph 4.3.2 delete: "and shall not be adversely affected when placed in a radiation field."

2. In paragraph 5.5.2.1 change "400 ± 80 cps." to read: "380-520 cps."

3. In the first sentence of paragraph 5.5.2.2 delete: "paragraph 3.11.2 of."

4. In the 2nd sentence of paragraph 4.11 change: "phase" to read "the integrity test."

5. Change the last sentence of paragraph 5.5.8 from: "Retorquing of seals at no less than 100 hours of operation is acceptable."

to read:

"Retorquing of seals at no less than 100 hours of pressurized operation is acceptable."

HAMILTON STANDARD
DIVISION OF UNITED AIRCRAFT CORPORATION
WINDSOR LOCKS, CONNECTICUT

H.S. 1368
Amend. 3
Page 1 of 1
E. C. AZ68898
Date: 3-20-62

H.S. 1368 "Procurement Specification for the JFC47 Fuel Adjustment Remote Trimmer"

Amendment 3

1. In paragraph 2.0 add the following:

   "HS236 - Specification for Treatment of Metal and Metal Parts"

2. Add paragraph 4.9.3 to read:

   4.9.3 PAINTING

   All exterior unmachined surfaces and tube O.D.'s except screws, nuts, receptacle, and surface under the protective plate on the mounting flange will be painted per HS236, Code 276.

1.0 GENERAL INFORMATION

1.1 SCOPE

This specification covers methods and procedures of shimming the JFC-47 main engine control.

1.1.1 For purposes of this specification controls are grouped as follows:

Group I Prod. S/N's 26628 thru 26642
Group II Prod. S/N's above 26642

1.2 EQUIPMENT REQUIRED

1.2.1 Assembly tools such as screw drivers and wrenches will be controlled by ass mbly floor supervision as to correct application in order to prevent parts mutilation yet do the job requirement.

1.2.2 Micrometer (1 inch)
Depth Micrometer (dial indicator type)

557450T-22 Flyball Alignment Tool
569455T-16 Rigging Pin
T-19 CIP weight Fixture
T-25 Tt2 Servo Motion Fixture
T-26 Ng Servo Transfer Fixture
T-27 CIP Dummy Cam
T-31 Integrating Piston Stop
T-35 CIP Shaft Locating Fixture
T-53 CDP Sensor Adj. Wrench
T-66 Ng Servo Dummy Cam
T-70 Roller Gage Block
T-71 Transducer & Integrating P.V. Fixture
T-75 Dummy Lever Paralleling Tool
T-76 Push Rod Adj. & Shim Fixture
T-77 Tt2 Transfer Tool
T-78 Ng Pilot Valve Set Block
T-79 CIP Feedback Bracket Align.Tool
T-80 Speed Set Cam Follower Fix
T-147

Hunter Force Gage (0 to 10 lb.)
Feeler Gage
Air Pressure & Gage (0 to 50 psig)

569455T-81 Tt2 Pivot Base Tool
T-82 Min Ratio Fixture
T-83 Tt2 Cam Follower Link Set Block
T-85 Dummy CDP Lever & CDP Paralleling Fixture
T-86 CDP Transfer Tool
T-87 CDP Bellows Setting Fixture
T-88 Trimmer Screw Locating Fix.
T-89 Mil. Push Rod Centering Tool
T-90 CIP Stop Transfer Fixture
T-91 Dummy CIP Sensor Lever
T-92 Pull Rod Shimming Fixture
T-93 Worm Wheel Align. Tool
T-94 Proportional Gain Lever Fix.
T-95 Power Lever Fixture
T-96 Tt2 Servo Piston Lock
T-97 Ball Check Valve Fixture
T-5 Adapter, CBA & Integrating Piston

2.0 INSPECTION REQUIREMENTS

The items marked with an asterisk (*) in this specification are inspection items and as such must be verified by inspection. Whenever initial shimming is changed to meet a functional requirement, the information must be recorded and witnessed as such on initial recording sheets.

3.0 RECORDING SHEETS

Assembly check list sheets as attached to this specification must be filled out where applicable. A copy of these sheets should accompany all units shipped.

NOTE: See appendix for an index of the various systems as listed in this specification.

HAMILTON STANDARD
DIVISION OF UNITED AIRCRAFT CORPORATION
WINDSOR LOCKS, CONNECTICUT, U. S. A.

TITLE: Use of Solid Shims

OBJECTIVE: To determine the proper amount of solid shims to be used.

REFERENCE: None

1. When selecting shims for any application, always select dash numbers that will provide the minimum number of shims.

   Ex. For an application where .060" shims are required and shim thicknesses of .020" and .030" are available, use two .030" shims as opposed to three .020" shims to make up the .060" shims needed.

TITLE: Run-in of PRV Sensor Assembly

OBJECTIVE: To break-in the PRV Pilot Valve, Housing, Damper and Drive Gear.

REFERENCE: Tool 569455-T-105

1. Assemble PRV Sensor in its Hydraulic Housing and install Tool 569455-T-105.

2. Adjust Pilot Valve for Position 1 defined as full Pilot Valve travel toward T.V. ΔP adjust end. With the PRV Sensor immersed in spindle oil (room temperature to 200° F, 10 micron filtration) drive the sensor at a speed of 3,500 to 4,500 rpm for four hours.

3. Upon completion of above four-hour run, adjust Pilot Valve for Position 2, defined as approximate zero position. At this position, repeat the hours and speed called out for Position 1.

4. Upon completion of Position 2 running, adjust Pilot Valve for Position 3, defined as .010-.020 less than full Pilot Valve travel toward the damper end. Repeat the hours and speed called out for Position 1.

* 5. Disassemble the PRV sensor and examine parts for distressed area following the 12 hours running. Abnormal wear or scuffing of bearing surfaces shall be cause for rejection, replacement of parts, and rerun of the 12-hour break-in.

LOG SHEET ASSEMBLY / TEST OPERATIONS

NO. C -

	ISSUED DATE	REVISIONS A	B	C	D	E	F	G
DATE								
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SHEET 1 OF

ALL ITEMS REQUIRE SIGNATURE OF ASSEMBLY/TEST OPERATOR

ITEMS MARKED (*) REQUIRES 100% COVERAGE BY INSPECTION

SUB. ASSY NAME	ASSEMBLY NO	ASSY. CHANGE LETTER

MAIN ASSY. NO.	MODEL NO.	PARTS LIST NO.	SERIAL NO.

STEP NO.	DESCRIPTION	ASSEM	INSP

TITLE: Shimming of Speed Set Cam Follower Lever (GROUP I CONTROLS)

OBJECTIVE: To shim the cam follower lever to a specified height above the centerline of the Ng speed servo bore; and to remove excessive pin "end-play" by the use of shims.

REFERENCE: Figure Titled: Speed Set Cam Follower Positioning Tool 569455T-80

1. Install spacer, cam follower lever and pin configuration into appropriate section of linkage housing.

2. Mount Cam Follower Positioning Tool on to the Ng speed servo bore (in lieu of Ng pull rod sleeve) so that the dowel pin of the tool locates in the appropriate threaded hole (provided for the pull rod sleeve).

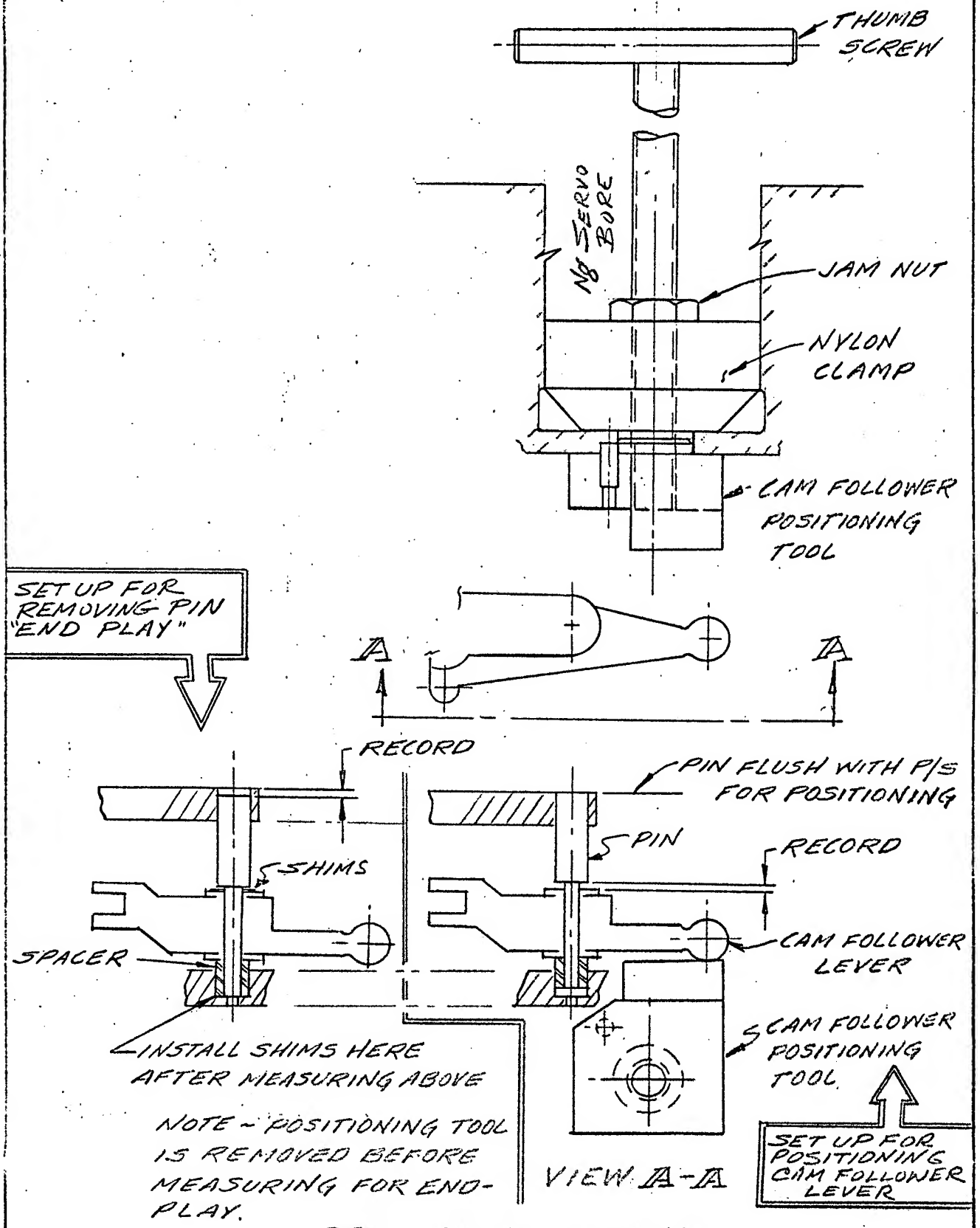
3. Install nylon clamp and jamb nut onto Thumb Screw Tool; and lock the jamb nut to the nylon clamp (normal torque) so that approximately 1/2 inch of thumb screw thread extends beyond the nylon clamp.

4. Insert the assembled thumb screw into the Ng speed servo bore of the linkage housing until the thumb screw threads into the Cam Follower Positioning Tool and the nylon clamp bottoms in the bore and locks the Positioning Tool in place with normal hand torque applied to the thumb screw.

5. Move the cam follower lever until it contacts the surface of the Positioning Tool; and while maintaining the top of the pin flush with the linkage housing parting surface, determine the gap between the shoulder of the pin and adjacent surface of the cam follower lever.
   Record shim stack _____.

6. Remove Cam Follower Positioning Tool from linkage housing. Install shims (determined in part 5) between cam follower lever and shoulder of pin; and then push the pin (containing the shims, lever and spacer) all the way down into the bore and with depth micrometer measure gap between top of pin and parting surface of linkage housing. This dimension is the shim stack required beneath the spacer to eliminate end play. The lever must move freely after shimming. Record shim stack - _____.
   Maximum of .002" end play permissible.

STEP NO.	DESCRIPTION	ASSEM.	INSP



SPEED SET CAM FOLLOWER
POSITIONING TOOL 569455-T-80

TITLE: Shimming of Speed Set Cam Follower Lever (Group II Controls)

OBJECTIVE: To shim the cam follower lever to a specified height above the centerline of the Ng speed servo bore; and to remove excessive pin "end-play" by the use of shims.

REFERENCE: Figure titled speed set cam follower positioning tool 569455T-80.

1. Mount the Cam Follower Positioning Tool on to the Ng speed servo bore (in lieu of Ng pull rod sleeve) so that the dowel pin of the tool locates in the appropriate threaded hole (provided for the pull rod sleeve).

2. Install nylon clamp and jamb nut onto Thumb Screw Tool; and lock the jamb nut to the nylon clamp (normal torque) so that approximately 1/2 inch of thumb screw thread extends beyond nylon clamp.

3. Insert the assembled thumb screw into the Ng speed servo bore of the linkage housing until the thumb screw threads into the Cam Follower Positioning Tool and the nylon clamp bottoms in the bore and locks the Positioning Tool in place with normal hand torque applied to the thumb screw.

4. Assemble pivot pin and cam follower into linkage housing.

5. Holding cam follower ball against the Cam Follower Positioning Tool determine the correct amount of shims needed between the cam follower and linkage housing with a feeler gage. Select a shim within ±.001. Record _____.

6. Remove pivot pin and cam follower from linkage housing and install shim determined in para. 5, cam follower, spacer and pivot pin into linkage housing.

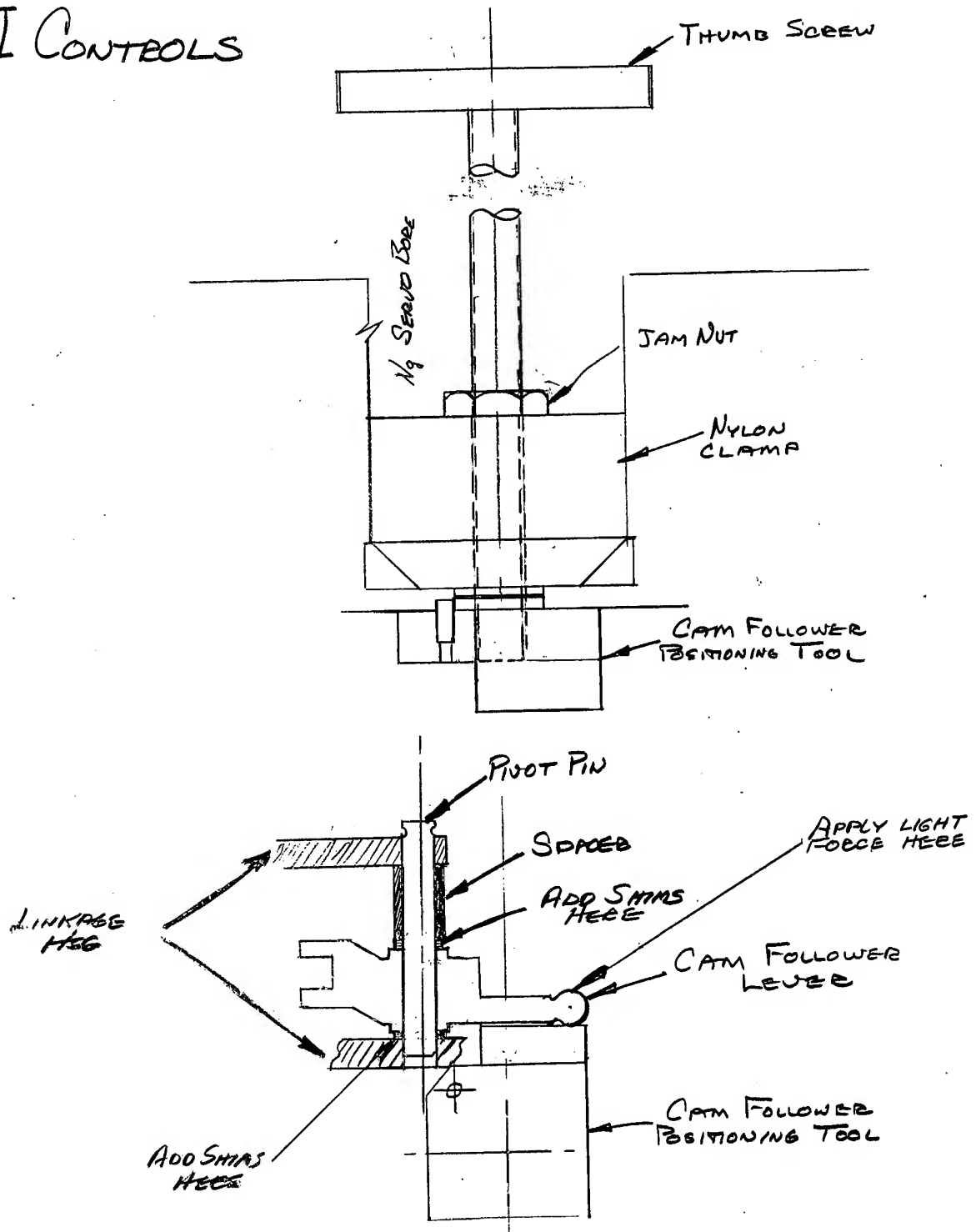
7. With the use of a feeler gage determine shims required between cam follower and spacer. Select shim within ±.001 Record._____

8. Remove pivot pin and install shim determined in para. 7 between spacer and cam follower.

9. Install pivot pin, pin retainer and screw.

10. Check cam follower end-play to insure that no error has been made in shimming.

GROUP II CONTROLS



SPEED SET CAM FOLLOWER
POSITIONING TOOL 569455-T-80

TITLE: Shimming of C.B.A. Cam Follower Lever.

OBJECTIVE: To shim the C.B.A. follower for position and to minimize "end play"

REFERENCE: Figure #1

1. Install CBA camfollower lever into linkage housing and insert shouldered pivot pin into provided bore and through the CBA follower.

2. Install Ng Servo Dummy Cam 569455T66 into speed servo bore of linkage housing so that Tt2 reset follower engages the appropriate detent of the dummy cam; and while maintaining this position, install sufficient shims under the CBA cam follower lever to align the ball follower with the CBA detent in the dummy cam.

   Record shims (if any) required _____.

3. Insert shims beneath cam follower; and using depth micrometer (or actual shims), measure from top of pin shoulder to surface of pad that retains pivot pin in linkage housing.

4. The resulting dimension is the amount of shims required beneath retainer plate and pad surface to minimize pivot pin end play.

   Record shim stack _____.

5. It is permissible to have .002" max. end play. The lever must move freely after shimming is completed.

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LOG SHEET ASSEMBLY / TEST OPERATIONS

NO: C -

	ISSUED DATE	REVISIONS A	B	C	D	E	F	G
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SHEET 1 OF

ALL ITEMS REQUIRE SIGNATURE OF ASSEMBLY/TEST OPERATOR

ITEMS MARKED (*) REQUIRES 100% COVERAGE BY INSPECTION

SUB. ASSY NAME	ASSEMBLY NO.	ASSY CHANGE LETTER

MAIN ASSY. NO.	MODEL NO.	PARTS LIST NO.	SERIAL NO.

STEP NO.	DESCRIPTION	ASSEM	INSP

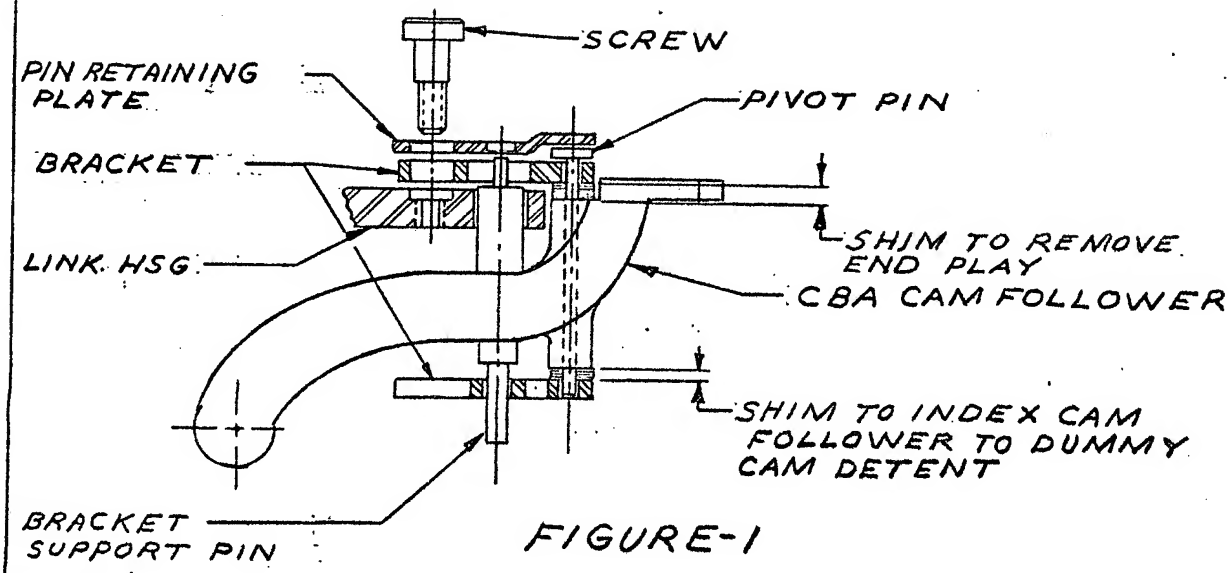


FIGURE-1

TITLE: Run-in of Speed Servo

OBJECTIVE: To break-in the speed servo in its linkage housing.

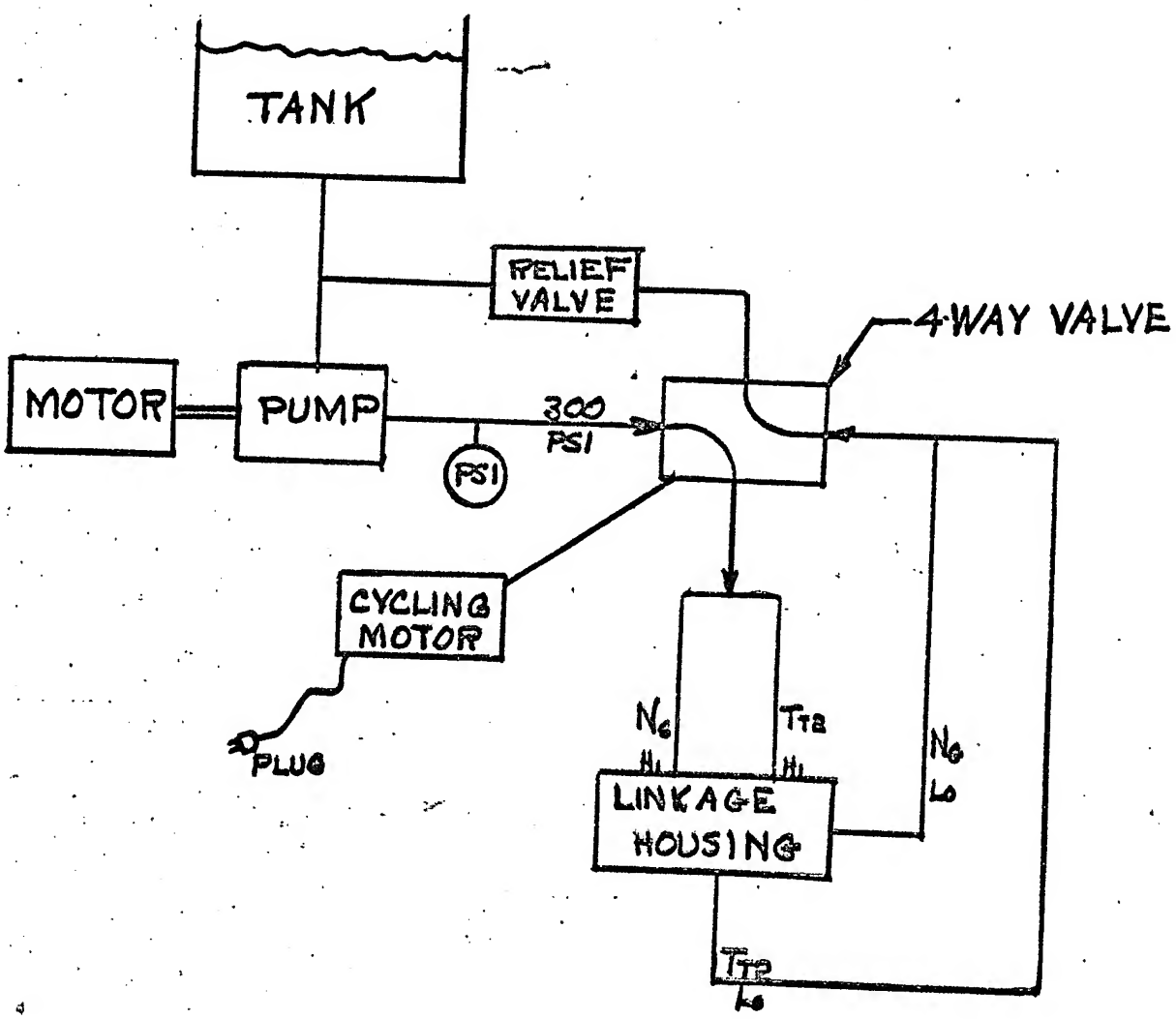
REFERENCE: Figure Tilted: Speed Servo Cycling Schematic Tool:

1. Assemble speed servo into its linkage housing and install tool Preload the CBA and accel. limiting cam followers against the speed servo cam. The linkage housing half of the Tt2 servo is utilized for this break-in procedure.

2. Cycle the speed servo for 5000 cycles full translation and rotation and return with spindle oil (10 micro filtration) at room temperature to 200° F. Maximum hydraulic pressure to servos to be 500 psig.

* 3. Following completion of 5000 cycles disassemble and examine the sensors, piston rings, and bores for distressed areas. Abnormal wear or scuffing of bearing surfaces shall be cause for rejection, replacement of parts, and rerun of the 5,000 cycle break-in.

SPEED SERVO CYCLING SCHEMATIC



TITLE: Shimming of Temperature Reset Follower and Bracket.

OBJECTIVE: To align the temperature reset cam follower with linkage housing slot; and to index the temperature reset linkage.

REFERENCE: Figure Titled: T_{t2} Reset Bracket Indexing Fixture 569455-T-84.

1. Place edge of reset cam follower hub against the wall of the linkage housing slot that is farthest away from the centerline of the T_{t2} servo bore.

2. While holding the reset follower lever in this position, use a feeler gage to determine the gaps between the reset follower lever and the adjacent casting walls. The shim stock should not move the follower more than .001" laterally away from slot and the total lateral motion at the follower should be less than .002".

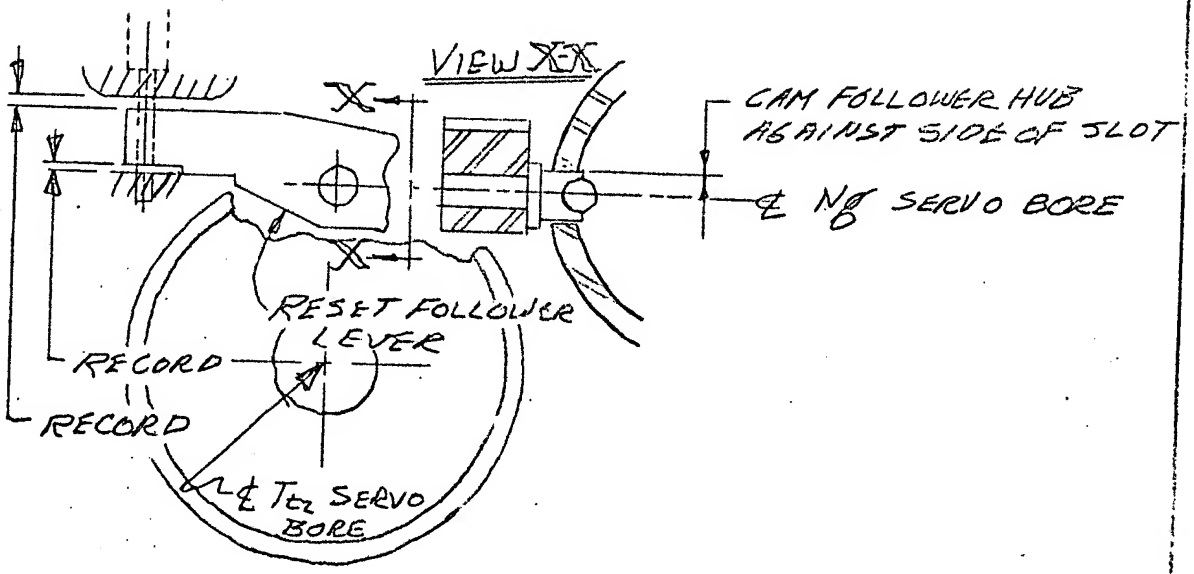
   a. Record shim stack in lever gap farthest from CL T_{t2} servo bore= _____.
   b. Record shim stack in lever gap nearest the CL T_{t2} servo bore= _____.

3. Install the reset lever bellcrank bracket onto linkage housing with a nominal shim stack-up under the bracket of .120. Final shimming of the bracket will be accomplished during the dry calibration per HS 1503.

NS F-295.0

LOG SHEET ASSEMBLY AND TEST OPERATIONS (CONTINUATION) | NO. C- SHEET OF

STEP NO.	DESCRIPTION	ASSEM	IN



Tt2 RESET BRACKET INDEXING FIXTURE
5G7455-T-84

TITLE: Shimming of Acceleration Lever Cam Follower.

OBJECTIVE: To locate and shim the acceleration lever cam follower 180° from the Tt2 reset lever cam follower.

REFERENCE: Figure #1.

1. Install Ng Servo Dummy Cam 569455T66 into speed servo bore of linkage housing so that Tt2 reset follower falls into corresponding detent of dummy cam. The Tt2 reset lever is the master for angular location of other followers.

2. With no shims installed, position the limiting lever so that the cam follower will fall into the dummy cam detent 180° opposite from the reset follower detent.

3. Determine the gaps between sides of lever and the linkage housing lugs with a feeler gage (or the actual shims) and record _____ gap A; _____ gap B.

4. Install shims to obtain a total side play of .002" max. Lever must move freely after shimming is completed.

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LOG SHEET ASSEMBLY / TEST OPERATIONS

NO. C -

	ISSUED DATE	REVISIONS A	B	C	D	E	F	G
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SHEET 1 OF

ALL ITEMS REQUIRE SIGNATURE OF ASSEMBLY/TEST OPERATOR

ITEMS MARKED (*) REQUIRES 100% COVERAGE BY INSPECTION

SUB. ASSY NAME	ASSEMBLY NO	ASSY. CHANGE LETTER

MAIN ASSY. NO.	MODEL NO.	PARTS LIST NO.	SERIAL NO.

STEP NO.	DESCRIPTION	ASSEM	INSP

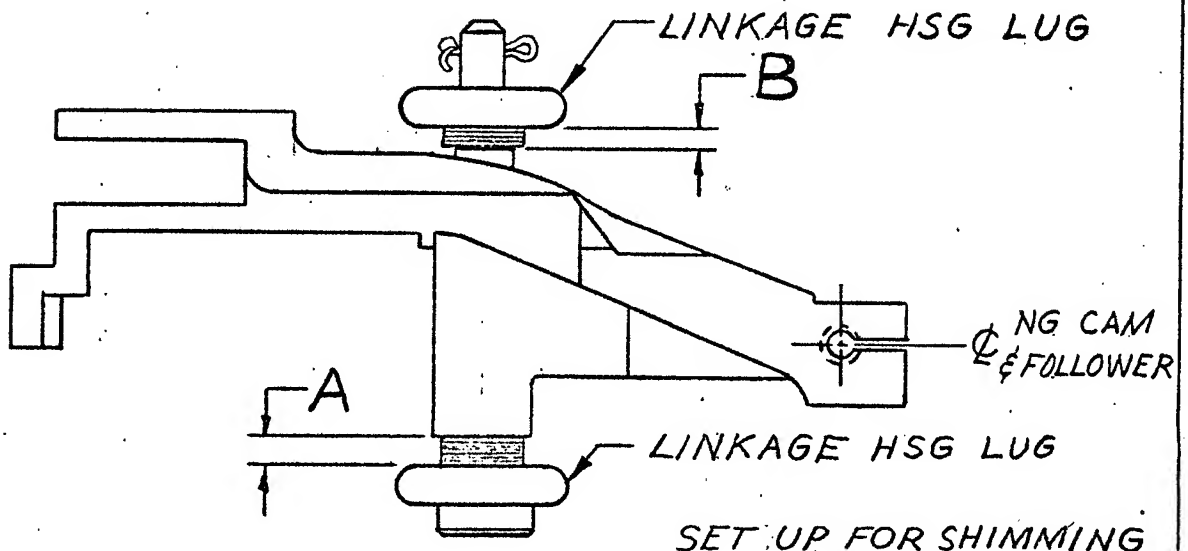


FIG. 1

SET UP FOR SHIMMING ACCEL. LEVER CAM FOLLOWER

TITLE: Adjustment and Shimming of C.D.P. System.

OBJECTIVE: 1) To set the C.D.P. system at null position by adjusting the C.D.P. bellows assembly and by shimming the C.D.P. multiplying lever and throttle valve pilot valve.
2) To compensate for an "body pressure sensitivity" as it affects the C.D.P. input lever.

REFERENCE: Figures Titled: Dummy CDP Lever & CDP Paralleling Fixture 569455T-85.
CDP Transfer Tool 569455T-86.
CDP Bellows Setting Fixture 569455T-87.

1. Install Dummy CDP Lever into the CDP Paralleling Fixture and tighten two screws "B" (use normal torque). Loosen set screws "C" & "D"; and insert the Set Block into the Paralleling Fixture and retain in position by tightening four screws "E" (use normal torque).

2. Turn in on Micrometer Head until it contacts pin "A" and pushes the Dummy CDP Lever to "bottom" against the Set Block. This will automatically place the Dummy Lever in a parallel position. Read the Micrometer. Record _____.

3. From the actual CDP lever to be used in the control read the offset dimension (scribed on the side of the lever) which is required to compensate for any body pressure sensitivity. Reference: HS 1558. (See Note A, Sheet 20.

4. Remove Set Block from the Paralleling Fixture and adjust the Micrometer Head (from the parallel position) in the proper direction to set up the offset dimensions obtained in part 3.

5. Tighten set set screws "C" & "D" (use normal torque) while pin "A" is contacting the indexed Micrometer to preset the Dummy CDP Lever in the offset position.

6. Remove preset Dummy CDP Lever from CDP Paralleling Fixture and install it into the CDP lever bore in the linkage housing. Retain the Dummy Lever in place with two screws "B" (use normal torque).

7. Loosen set screws "G" & "H" on CDP Transfer Tool and install the CDP Transfer Tool into the CDP bellows bore of the linkage housing. Position the Cover and lock it in place with three screws "F" (use normal torque).

8. Allow the External Piston of the Transfer Tool to contact the bottom of the CDP bellows bore and lock it in this position with set screw "G" (use normal torque). Lower the Internal Piston of the Transfer Tool until it contacts pin "A" of the preset Dummy CDP Lever and lock it in this positon with set screw "d" (use normal torque).
CAUTION: Always preset the External Piston when the Internal Piston set screw "H" is loose. This will prevent interference with pin "A".

9. Remove preset CDP Transfer Tool from linkage housing (loosen and remove 3 screws "F") and install it into the CDP Bellows Setting Fixture so that the Internal Piston will contact ONLY pin "A" of the Adjustable Bracket. Retain the CDP Transfer Tool in this position with two screws "I" (use normal torque).

10. Move the two Adjustable Brackets on the CDP Bellows Setting Fixture until they contact the Internal and External Piston of the CDP Transfer Tool. Lock the Brackets in position with screws "J" & "K" (use normal torque).

11. Group I Controls

Remove the CDP transfer tool from the CDP Bellows Setting Fixture and install the CDP bellows assembly in its place. Insert the asbestos gasket under the bellows flange that will be used to curtail air leakage during the assembly of the control.

Group II Controls

Remove the CDP Transfer Tool from the CDP Bellows Setting Fixture and install the CDP bellows assembly in its place. Insert the washer under the bellows flange.

12. Procedure for adjusting the CDP bellows when NO CDP lever offset is required to compensate for body pressure sensitivity:

Place 2.3# weight on motor bellows (pilot the weight between the three dowels) and adjust the threaded bolt until the pin firmly contacts the slot in the Adjustable Bracket. Suspend 6.5# weight from the evacuated bellows stem (by means of threaded Block); and while maintaining the 2.3# weight on the motor bellows, adjust the evacuated bellows on the threaded bolt until the bellows contacts the lower Adjustable Bracket.

13. For CDP systems requiring CDP lever offset to compensate for body pressure sensitivity, the following procedure should be used:

Obtain the load that is required to move the CDP lever to the offset position (per HS 1558 the required offset weight is scribed on the actual CDP lever along with the offset position). If the CDP lever requires an offset towards the evacuated bellows, subtract the scribed weight from 2.3# and use a Hunter Force Gage to set up the remaining load on the motor bellows. While maintaining the Hunter Force Gage load, adjust the threaded bolt until the pin seats in the slot of the Adjustable Bracket. Remove Hunter Force Gage and use Clamp and two screws "L" (use normal torque) to retain pin in Bracket slot. Suspend 6.5# weight from evacuated bellows stem and adjust the bellows on the threaded bolt until the bellows contacts the lower Adjustable Bracket.

If the CDP lever requires an offset towards the motor bellows, place 2.3# weight on the motor bellows and adjust threaded bolt until pin seats in slot. Subtract the scribed weight from 6.5#; and while maintaining the 2.3# weight on the motor bellows, use a Hunter Force Gage to set up the remaining load on the evacuated bellows (by means of threaded Block) and adjust the evacuated bellows until it contacts the lower Adjustable Bracket. (See Note A, Sheet 20).

CAUTION: Load adjustment should always reduce the preload (2.3# and 6.5# respectively) on either bellows to insure adequate bellows life.

14. Return to linkage housing (with the preset Dummy CDP Lever still in position) and use a small "C" clamp to retain Roller Gage Block 569455-T-70 and CDP multiplying lever assembly on to the Dummy Lever. Use actual shims to determine the gap between the CDP multiplying lever bracket and the linkage housing mounting pad. Make sure that the multiplying bracket pivots are making contact during the shimming.

Record shim stack _____.

15. Install assembled spider housing into the linkage housing (3 screws - normal torque). Set up null position on the throttle valve pilot valve by inserting Rigging Pin 569455-T-16 into appropriate slot and compressing the pilot valve against the spring (out direction) until the pilot valve land contacts the Rigging Pin. With the pilot valve held against the Rigging Pin, insert the Feeler Gage between the pilot valve tip and the mating pad of the multiplying lever (which is still clamped in position on the Dummy CDP Lever) and determine the gap. Refer to the matched valve data sheets and obtain the true null position of the throttle valve pilot valve as referenced from the Rigging Pin. If the null position is listed as "OUT" from Rig Pin position, ADD the specified amount to the Feeler Gage dimension. If the null position is designated as "IN" from Rig Pin position, SUBTRACT the recorded amount from the Feeler Gage dimension.

Record the computed shim stack _____.

16. Remove the Dummy CDP Lever from the linkage housing and install properly shimmed CDP multiplying lever assembly (see part 14); adjusted CDP bellows assembly (per parts 12 or 13); and the CDP input lever. Insert the proper amount of shims (part 15) under the T.V. pilot valve tip.

17. With the CDP bellows and cover installed in the linkage housing, pressure test the assembly by putting 100 psi air into the motor bellows and checking for leaks around the cover and out the overboard drain line. No leakage is permitted.

NOTE A

Make the following correction to the "x" or offset dimension and the "w" or load req'd for offset to the "x" and "w" scribed on the side of the lever. This correction, which follows, must be used in paragraph 3 and 13:

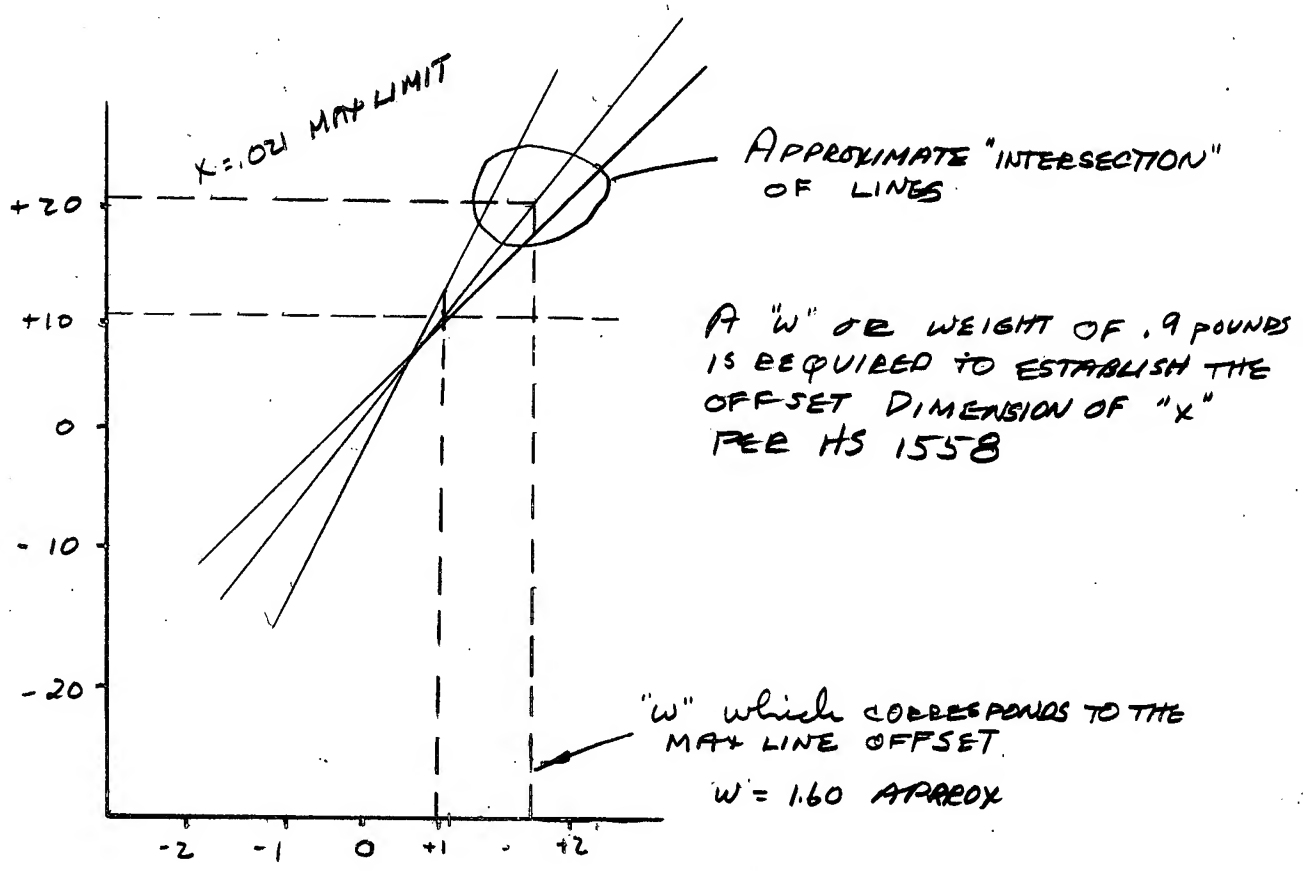
(a) Add +.011" to "x" dimension of lever.
(b) Add +.8 lb. to "w" of lever.

NOTE B

On some levers accepted on MRO the offset dimension will be more than .010. (Reason for being put on MRO) when such a lever is used, do not add the full .011 as specified in Note A (see Amendment 1), but add only enough to bring the offset dimension to .021.

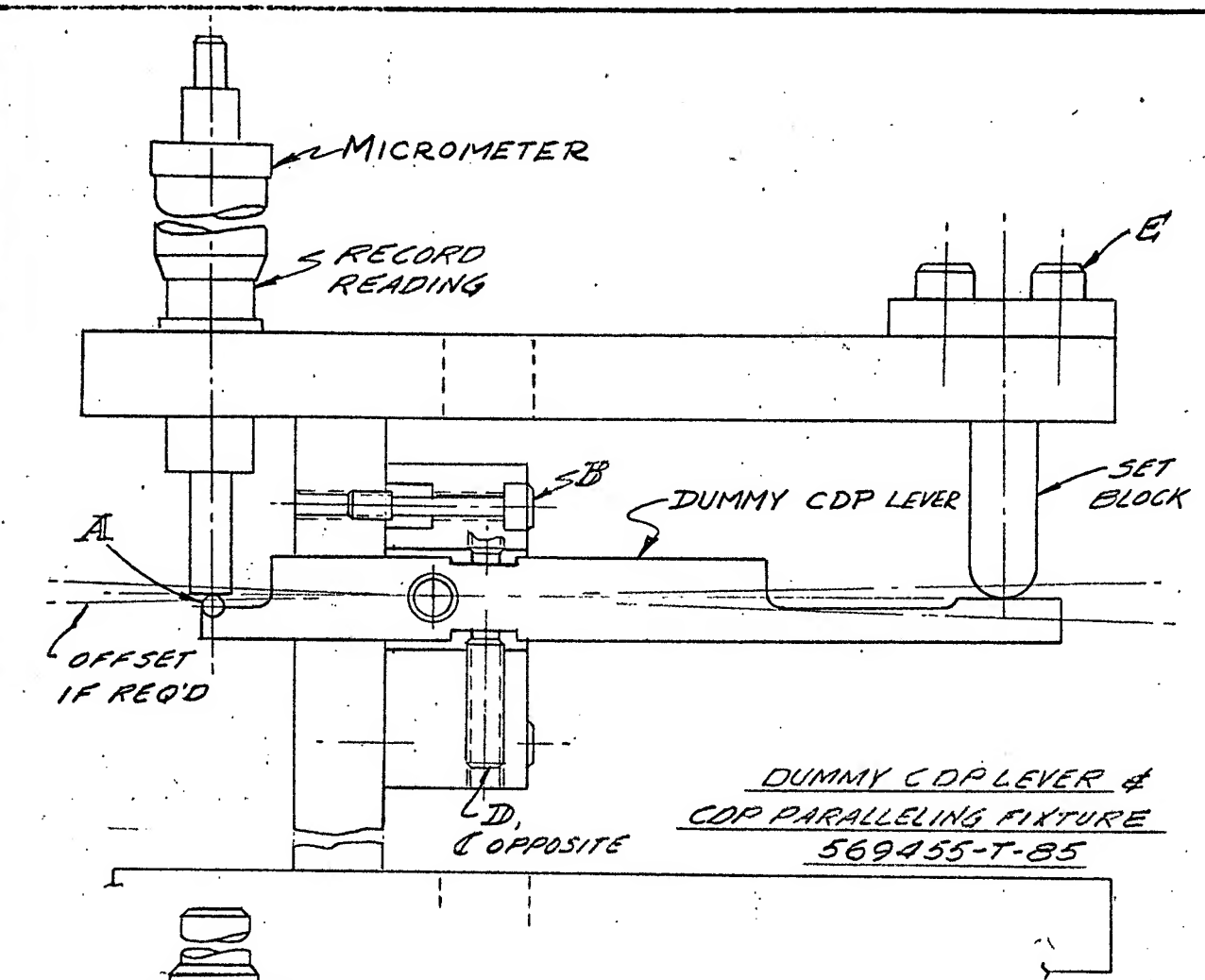
From the actual plot of the lever find the "w" or weight required to e stablish the offset dimension of .021 and use this as the "w" or offset weight when adjusting the CDP bellows in the fixture.

EXAMPLE:

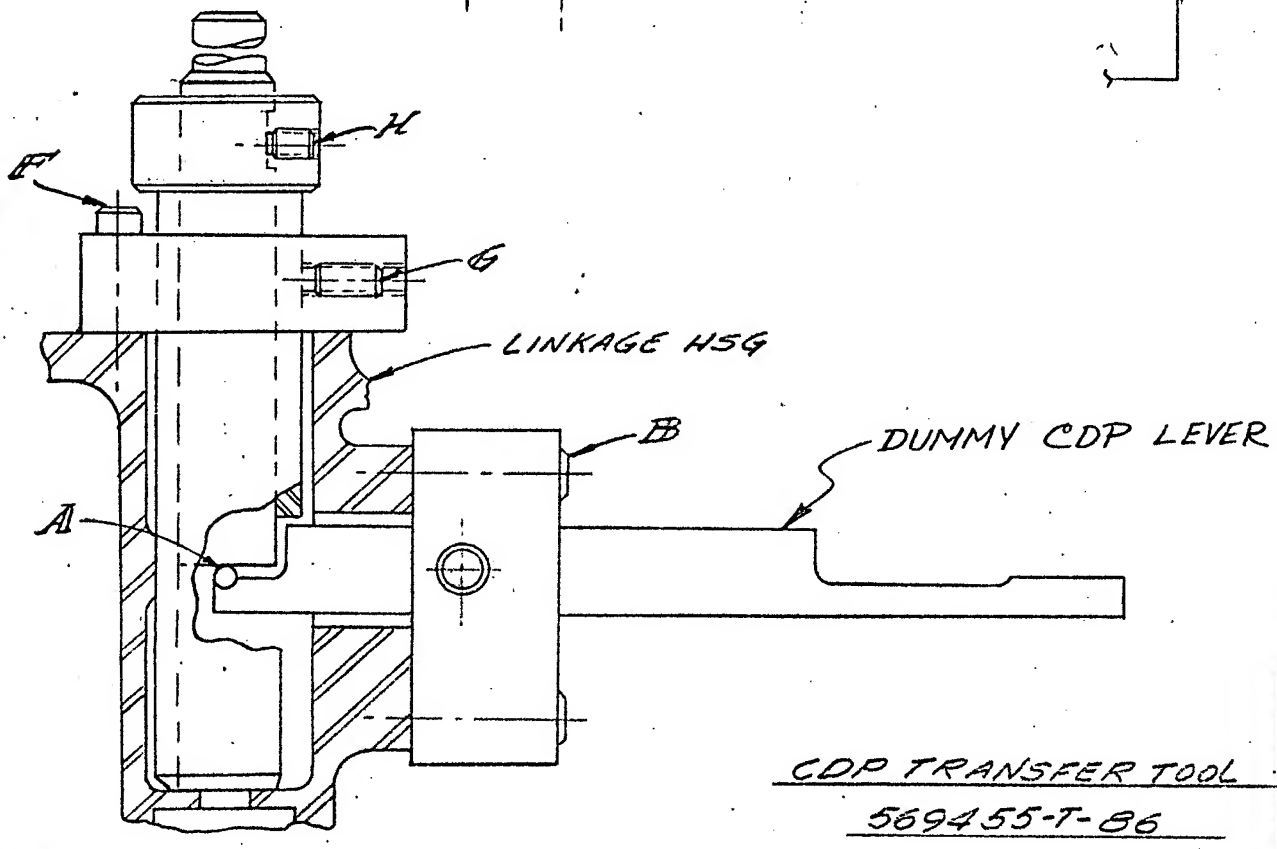


When deviating from HS 1502A and following the note concerning MRO levers the weight should be obtained from the curve as illustrated; that is, 1.60 - .90 = 0.70 pounds.

STEP NO.	DESCRIPTION	ASSEM	INSP



DUMMY CDP LEVER & CDP PARALLELING FIXTURE 569455-T-85



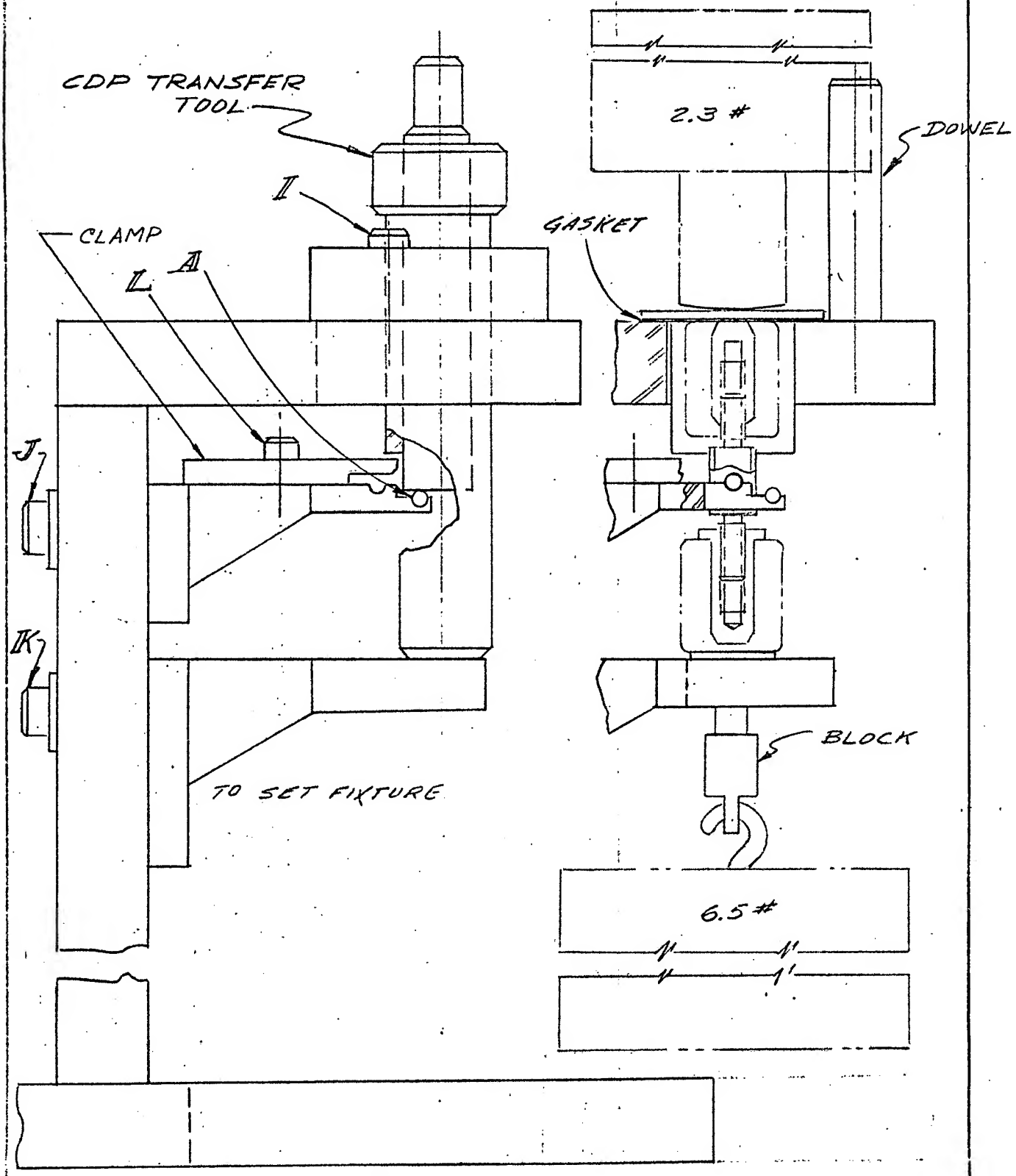
CDP TRANSFER TOOL 569455-T-86

HS F-295.6

LOG SHEET ASSEMBLY AND TEST OPERATIONS (CONTINUATION)

NO. C-
SHEET 1 OF

STEP NO.	DESCRIPTION	ASSEM.	INSP.



CDP BELLOWS SETTING FIXTURE
569455-T-87

TITLE: Adjustment of Min. Ratio

OBJECTIVE: To establish a .057" distance between the centerline of the Wf/P3 rollers and the centerline of the T.V. multiplying lever pivot.

REFERENCE: Figure Titled: Min. Ratio Fixture 569455-T-82.

1. From the side of the T.V. multiplying lever read scribed dimension G.
2. Using formula (shims = Dim. G - 2.478) determine shims required and insert them into Min. Ratio Fixture and tighten screw A (use normal torque)
3. Install Min. Ratio Fixture on to T. V. multiplying lever pad in linkage housing and secure in position with the two screws provided (use normal torque).
   NOTE: Use shims (recorded on CDP system shimming part 14 page 11) under the Min Ratio Fixture to compensate for P3 lever offset.
4. Install spider housing into linkage housing (3 screws - normal torque) and set the droop lever at min ratio position.
5. Set the min ratio adjustment in its midposition and torque the locking screw to 30-32 in-lbs. using the head end (internal hex).
6. Shim under the roller head assembly to make the rollers fall into the cradle of the fixture.
7. Final adjustment of the min ratio (using eccentric screw) will be made later per the min-max line dry calibration procedure per specification HS 1503.

HS F-295.7

LOG SHEET ASSEMBLY / TEST OPERATIONS

NO. C-

	ISSUED DATE	REVISIONS A	B	C	D	E	F	G
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PROD. ENG.								
INSP.								

SHEET 1 OF

ALL ITEMS REQUIRE SIGNATURE OF ASSEMBLY/TEST OPERATOR

ITEMS MARKED (*) REQUIRES 100% COVERAGE BY INSPECTION

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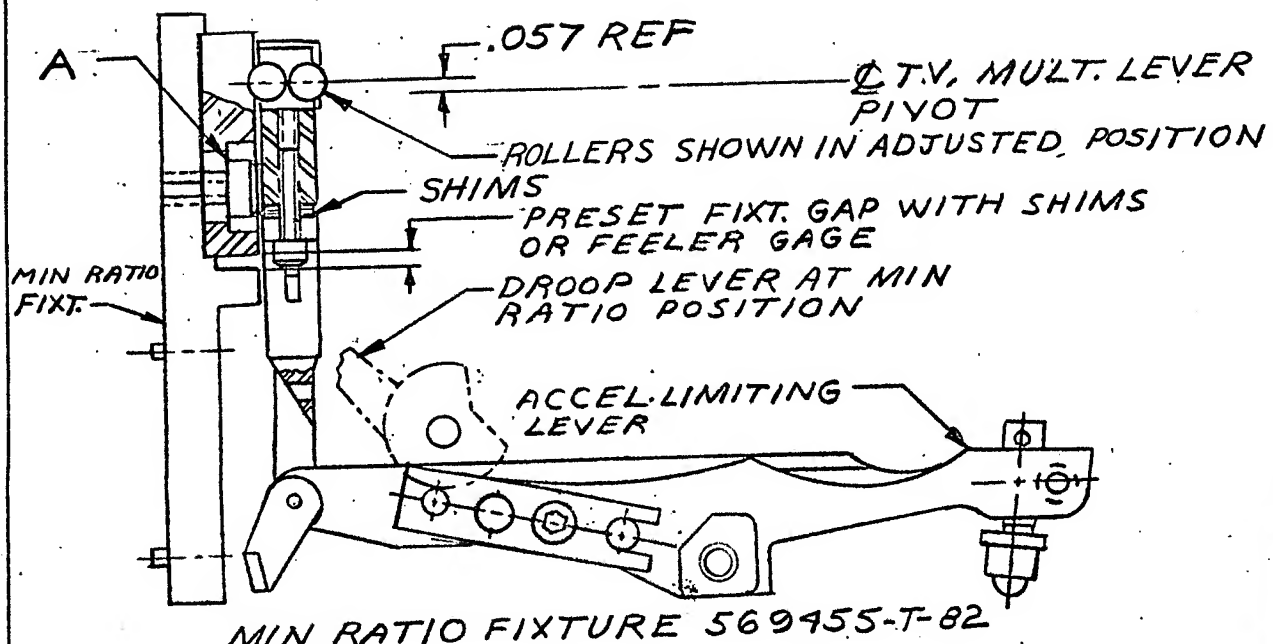
MAIN ASSY. NO.	MODEL NO.	PARTS LIST NO.	SERIAL NO.

STEP NO.	DESCRIPTION	ASSEM	INSP



MIN RATIO FIXTURE 569455-T-82

TITLE: Shimming of throttle valve position adjustment (Group II controls only).

OBJECTIVE: To ensure correct temperature compensation by incorporating required number of shims.

REFERENCE: None.

1. Assemble the adjusting retainer, push rod, spacer and headless pin with .075 amount of shims.

2. Ensure that the spring retainer is positioned against the top of the counterbore in the housing.

3. Screw in the assembly referred to in 1. until the push rod just butts on the spring retainer.

4. Measure the distance from the top of the adjusting retainer to the housing face (Dimension A).

5. Measure the corresponding distance from the face on the cover to the bottom of the counterbore in the cover (Dimension B).

6. Amount of shims to be removed

   = A-B + .006"

7. Remove shims specified in 6. and complete assembly.

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MAIN ASSY. NO.	MODEL NO.	PARTS LIST NO.	SERIAL NO.

STEP NO.	DESCRIPTION	ASSEM	INSP

TITLE: Shimming of Ng and CIP Cam & Pull Rod Assemblies.

OBJECTIVE: To shim the Ng and CIP pull rods to a specified trunnion pin to cam detent dimension.

REFERENCE: Figure Titled: Pull Rod Shimming Fixture 569455T-92

1. Assemble both pull rods using sleeve spacer, lower cam retainer, thrust bearing, and nut (torqued finger tight to remove any clearance between parts.) Omit shims from pull rod.

2. Install upper cam retainer and cam assembly on to pull rod assembly and fasten the two units together with the two screws provided (use normal torque).

3. Ng Cam and Pull Rod Assembly: Install the Ng cam assembly into Pull Rod Shimming Fixture. Place cam detent and pull rod trunnion pin slot over the appropriate pins of the Fixture and tighten the thumb screw A over the cam (use hand torque). Next, move the adjustable block of the Fixture until thrust bearing is against the lower cam retainer and lock the thumb screw "B" in place while maintaining cam assembly in this rigid position. (use hand torque)

4. Using a depth micrometer, measure from the edge of the two protruding dowel pins (of the fixture) to the surface marked "Ng cam" on the adjustable block. This dimension is the number of shims required between the sleeve spacer and the shoulder of the pull rod. Record shim stack _____.

5. Disassemble cam and pull rod assembly and install shims. Complete assembly of cam and pull rod. Again, the nut retaining the thrust bearing should be torqued only finger tight.

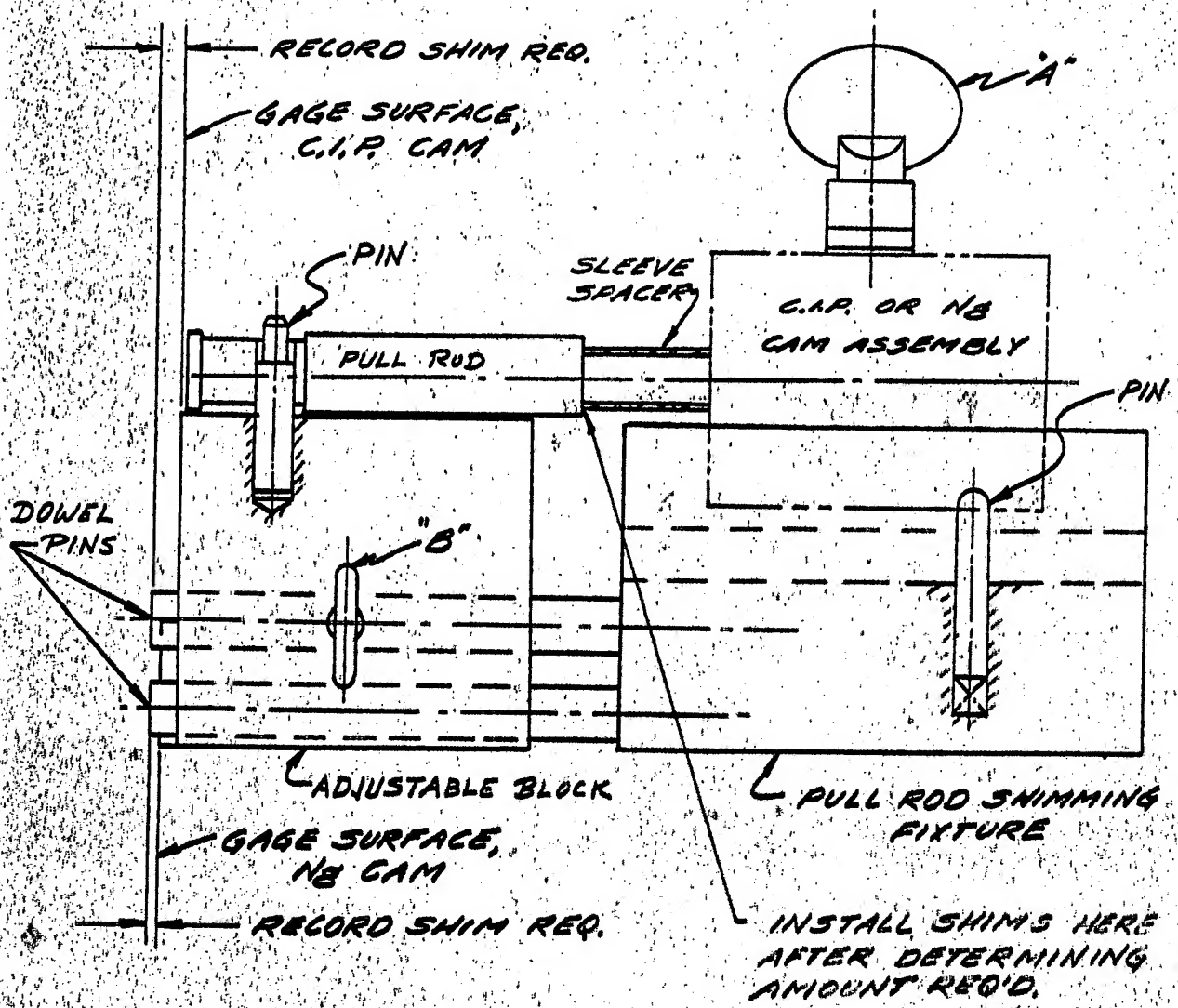
6. CIP Cam and Pull Rod Assembly: Install the CIP cam assembly into the Pull Rod Shimming Fixture. Place the cam detent and the pull rod trunnion pin slot over the appropriate pins of the Fixture and tighten thumb screw "A" over the cam (use hand torque). Next, move the adjustable block of the Fixture until the thrust bearing is against the lower cam retainer and lock thumb screw "B" in place (use hand torque) while maintaining cam assembly in this rigid position.

7. Using a depth micrometer, measure from the edge of the two protruding dowel pins (of the Fixture) to the surface marked "CIP Cam" on the adjust-

STEP NO.	DESCRIPTION	ASSEM	INSP

able block. This dimension is the number of shims required between the sleeve spacer and the shoulder of the pull rod. Record CIP shim stack _____.

8. Disassemble cam and pull rod assembly and install shims. Complete assembly of CIP cam and pull rod. Again, the nut retaining the thrust bearing should be torqued only finger tight.



PULL ROD SHIMMING FIXTURE
569455 T-92

TITLE: Shimming of droop lever assembly
(Group II controls only)

OBJECTIVE: To control axial clearance of droop lever assembly in spider and guide housings.

REFERENCE: None.

1. Assemble guide housing to spider housing.

2. Assemble ball bearings into droop lever making sure that bearings are completely bottomed in their droop lever bores. Also install shims adjacent to the droop lever bearing so that shims protrude slightly beyond end face of droop lever.

3. Install droop lever (with bearings), pivot shaft, spacer, and shims into spider housing and guide assembly. The spacer is located between the spider housing and the droop lever bearing.

4. Move droop lever axially to remove end play between it and spider housing. Using feeler gage, measure clearance between shims and guide housing. Determine shimming required to produce .000-.003 axial clearance.

5. Re-assemble with shims determined in 4. Check end play with feeler gage to assure it is .000 to .003 and make certain that droop lever operates freely.

TITLE: Shimming of Ng Speed Governor and Pilot Valve

OBJECTIVE: To shim the Ng pilot valve for null position.

REFERENCE: Figure Titled: Set Block 569455-T-78

1. Install Flyball Alignment Tool 557450-T-22 into assembled governor head and Ng pilot valve set and insert Ng pilot valve into the spider housing.

2. Install the sleeve bushing into the bearing housing and install the bearing housing on to the spider housing (3 screws - normal torque) so that the sleeve bushing pilots on the stem of the governor weight head.

3. Place Set Block over the stem of the Ng pilot valve: and while disc Z is contacting spider housing surface, adjust screw X in set block until pilot valve, governor head, and sleeve bushing "bottom" in bearing housing. Tighten lock nut Y (by hand), and remove Set Block from spider housing.

4. Using a depth micrometer, determine depth from surface of Set Block to where adjustable screw X contacted the shoulder of the Ng pilot valve. Call this depth DIM A and record _____.

5. From the match data sheets for the spider housing, obtain the "S" dimension for the Ng pilot valve at null position.

6. Use formula (Shims = S - A) and compute shims required to set the Ng pilot valve at null position. Record shim stack _____

7. Remove Flyball Alignment Tool from governor head and install required shims in the area between the sleeve bushing and the bearing housing.

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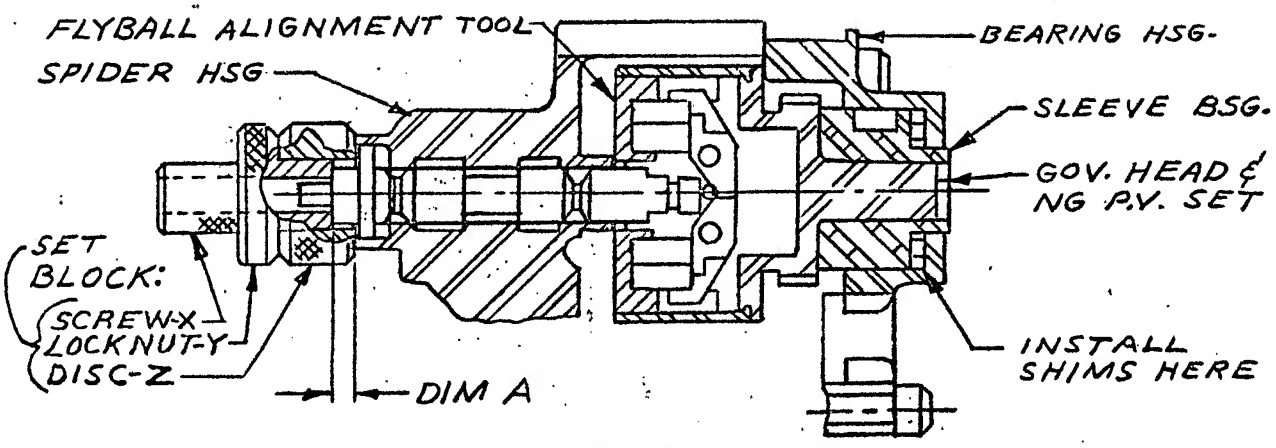
STEP NO.	DESCRIPTION	ASSEM	INSP



NG PILOT VALVE SET BLOCK 569455-T-78

TITLE: Run-in of Spider Housing Pilot Valves.

OBJECTIVE: To break-in the Ng, Tt2 and T.V. Pilot Valves over their full operating ranges.

REFERENCE: Tool

1. Install the Spider Housing Assembly containing the Ng, Tt2, and T.V. Pilot Valves and Gear Train in tool

2. Adjust Ng, Tt2, and T.V. Pilot Valves for Position 1 such that the gears run against their respective spider housing faces. With the spider housing immersed in spindle oil (at room temperature to 200°F; 10 micron filtration) drive the gear train at a speed of 3,500 to 4,500 rpm for four hours.

3. Upon completion of above four-hour run, adjust Ng, Tt2 and T.V. for Position2, defined as the approximate null position for each valve. At this position, repeat the hours and speed called out for Position 1.

4. Upon completion of Position 2 running, adjust Ng, Tt2 and T.V. Pilot Valves for Position 3, defined as the point at which the full diameter of the pilot valve is flush to .020" below the cast surface of the spider housing at the valve tip end. Repeat the hours and speed called out for Position 1.

* 5. Following the 12 hours total running, disassemble pilot valves and gear train and examine parts for distressed areas. Abnormal wear or scuffing of bearing surfaces shall be cause for rejection, replacement of parts and rerun of the 12-hour break-in.

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MAIN ASSY. NO.	MODEL NO.	PARTS LIST NO.	SERIAL NO.

STEP NO.	DESCRIPTION	ASSEM	INSP

TITLE: Shimming of CIP Worm Wheel and Shaft.

OBJECTIVE: To properly align worm wheel with worm gear shaft; and to eliminate CIP shaft and spur gear end play.

REFERENCE: Figure Titled: Worm Wheel Aligning Tool 569455-T-93.

1. Place spider housing casting on to gage surface of Worm Wheel Aligning Tool so the three mounting lugs contact the gage surface.

2. "Line-up" the spider housing mounting lug (that contains the CIP worm wheel shaft bore) with the slot in the Aligning Tool; and insert the CIP worm wheel and shaft assembly (with shim cup in place) through the aligned bore and slot.

3. Slide the spider housing along slot of Aligning Tool until worm wheel is directly under the gage plate of the Aligning Tool.

4. Use feeler gage to determine gap between spider housing lug and bottom of the shim cup when the worm wheel is making full contact with the gage plate. Do not insert pin through shim cup and worm wheel boss (during measuring operation) because tolerances may prevent shim cup from contacting the bottom of the worm wheel boss. An alternate method would be to keep adding shims into shim cup until worm wheel contacts the gage plate. Record shim stack _____.

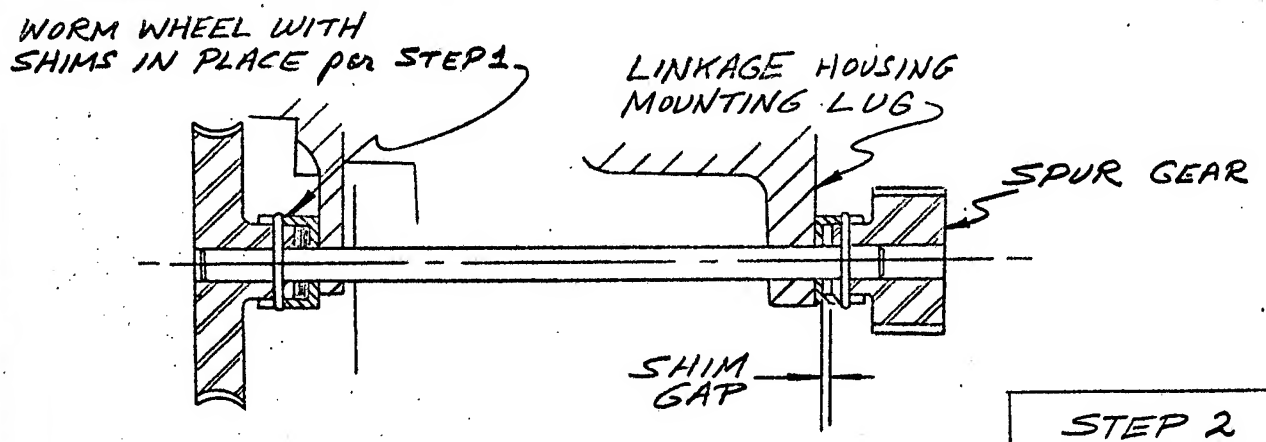
5. Insert the shims (determined in part 4) into worm wheel shim cup and install pin and lockwire. Build up the spider housing and the bearing housing. Mount the worm gear shaft into the spider housing to match with the CIp worm wheel and install bearing housing on to the spider housing (3 screws - normal torque).

6. Install spider housing into linkage housing so that worm wheel shaft passes through mounting lug in the linkage housing.

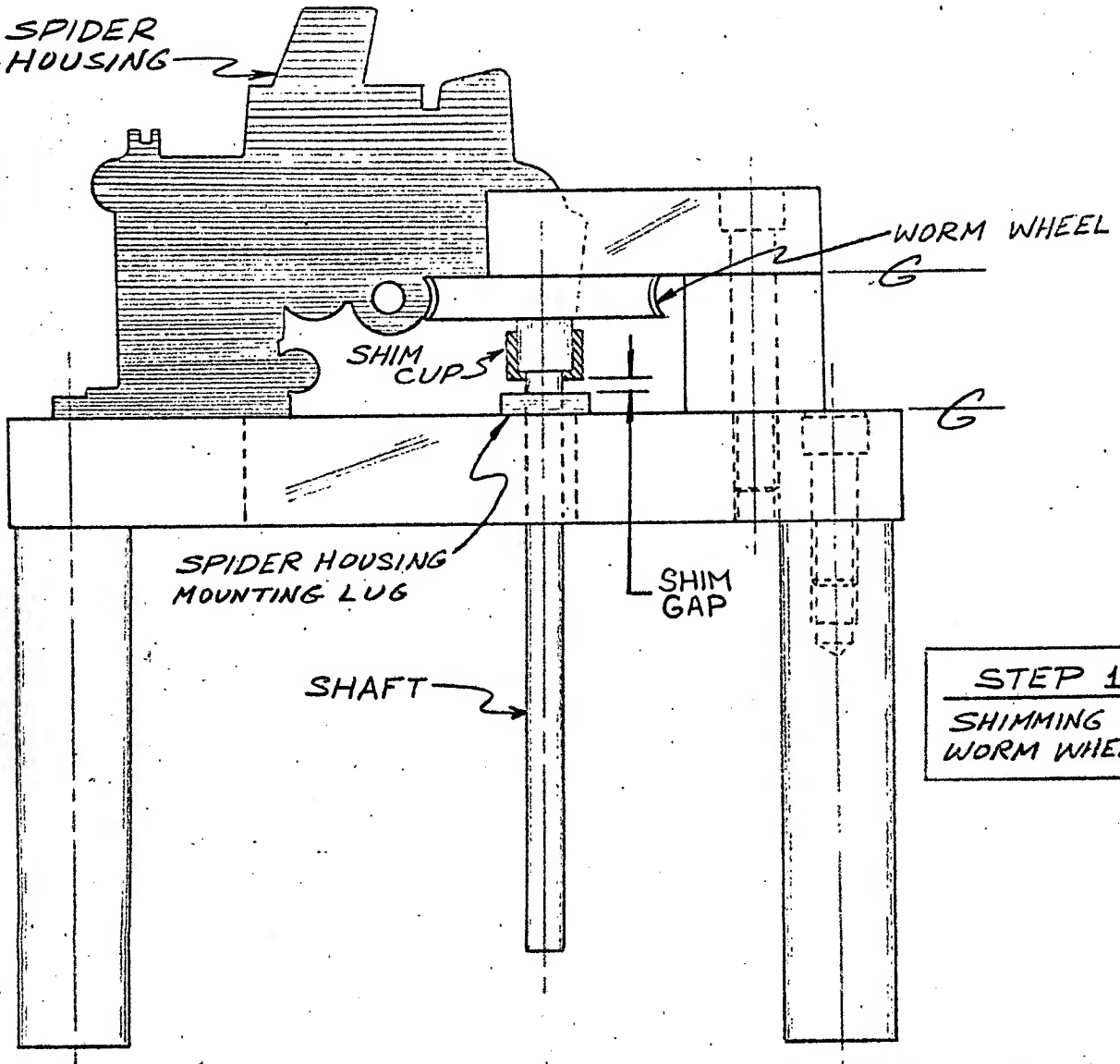
7. Retain spider housing to linkage housing (3 screws - normal torque) and install CIP spur gear, pin and shim cup on other end of worm wheel shaft.

8. Add sufficient shims into the spur gear shim cup to control worm shaft end play (between spur gear shim cup and linkage housing lug) to .002" max. Record spur gear shim stack _____.

STEP	DESCRIPTION	ASSEM	INSP



STEP 2
SHIMMING OF SPUR GEAR



STEP 1
SHIMMING OF WORM WHEEL

WORM WHEEL ALIGNING TOOL 569455-T-93

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MAIN ASSY. NO.	MODEL NO.	PARTS LIST NO.	SERIAL NO.

STEP NO.	DESCRIPTION	ASSEM	INSP.

TITLE: Alignment and Shimming of Trimmer Housing. (GROUP I CONTROLS)

OBJECTIVE: To align the military and idle adjusting screws in the servo housing bore; and to position and shim the trimmer housing with respect to the trimmer blades and military push rod.

REFERENCE: Figures Titled: Trimmer Screw Locating Fixture & Linkage Housing Plate 569455T-88.
Military Push Rod Centering Tool 569455T-89.
Power Lever Fixture 569455T-95.

1. With "build-up" military and idle adjusting screw and cartridge assemblies properly located in the Servo Housing trimmer bore, install Trimmer Screw Locating Fixture (3 screws - normal torque) into place on the crush seal pilot diameter of the Servo Housing trimmer bore, and index to provided dowel hole. Slide the adjustable "V" block of the fixture until it is aligned with the scribed center line, and then lock the screw "X" (use normal torque). Position the military and idle adjusting screws against the preset "V" block and orient the two screws so that the "V" block will contact the diameter of the screw and not the flat surface.

2. With the military and idle adjusting screws located on the "V" block, install the two retaining screws and tighten the trimmer cartridges securely in place (use normal torque).

3. Install Linkage Housing Plate 569455T-88 (with trimmer housing in position) on to the servo housing so that the military and idle trimmer blades "ride" in their respective bores in the trimmer housing. Trimmer blades should be adjusted CCW (to insure that bores of trimmer housing contact shoulder of trimmer blade and not blade contour) while trimmer housing is held against the slot radius of the Linkage Housing Plate.

4. Move the trimmer housing Towards the Linkage Housing Plate until it "seats" on the shoulder of the military or the idle trimmer blade; and measure the gap between the plate and the mounting flange of the trimmer housing.

5. Move the trimmer housing away from the Linkage Housing Plate until it "seats" on the shoulder of one of the trimmer blades; and, again, measure the gap between the plate and the trimmer housing flange.

6. Add the gaps (measured in part 4 and 5 above) together and divide by two. This will give the average amount of shims required to properly position the trimmer housing with respect to the trimmer blades.

   Record shim stack _____.

7. Remove the trimmer housing from the Linkage Housing Plate and install the military push rod (stripped down) into the trimmer housing bore.

8. Install Military Push Rod Centering Tool through the pin hole in the military push rod (by means of pin B); and tighten nut A against the military push rod (use hand torque). Remove pin B from Centering Tool after nut A is tight against military push rod.

9. Position trimmer housing (with shims determined in part 6) into appropriate bore in the linkage housing and install speed trim lever and speed set cam follower (engage cam follower with trim lever).

10. Install Power Lever Fixture on to the linkage (3 screws - normal torque) housing, and insert the power lever and cover assembly on the dowel pins of the fixture (at one end) 3 screws - normal torque, and the bearing in the linkage housing (at the other extremity).

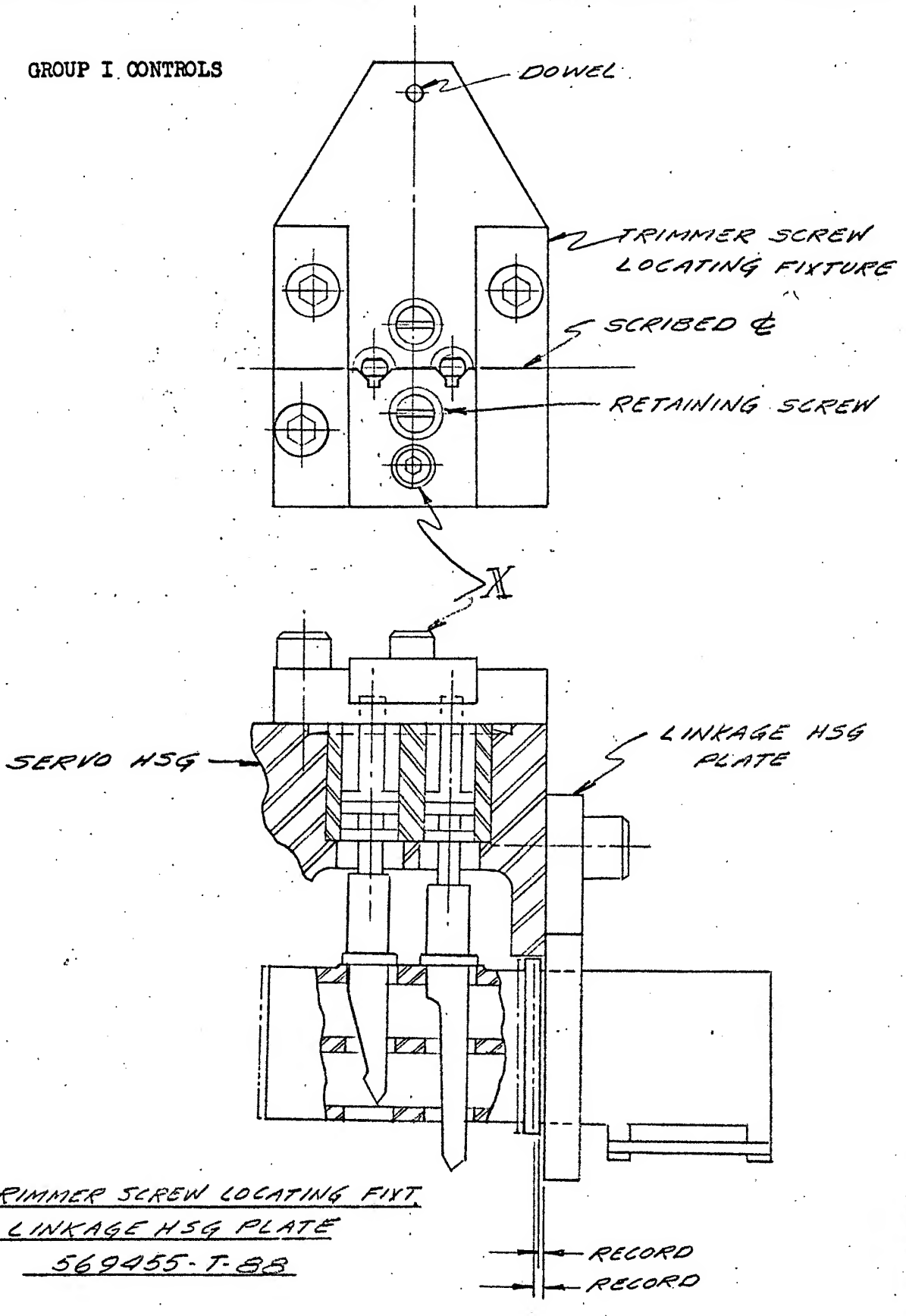
11. Set the power lever to military position (65°) and move trimmer housing and shims laterally on the linkage housing parting surface until the Centering Tool contacts the roller of the speed trim lever. This will align the centerline of the military push rod with the speed trim lever roller at military power lever position.

12. Place scribe marks on the trimmer housing mounting flange and the linkage housing to define the alignment established in part 11.

13. Remove Centering Tool from trimmer housing and power lever fixture from linkage housing.

STEP NO.	DESCRIPTION	ASSEM	INSP

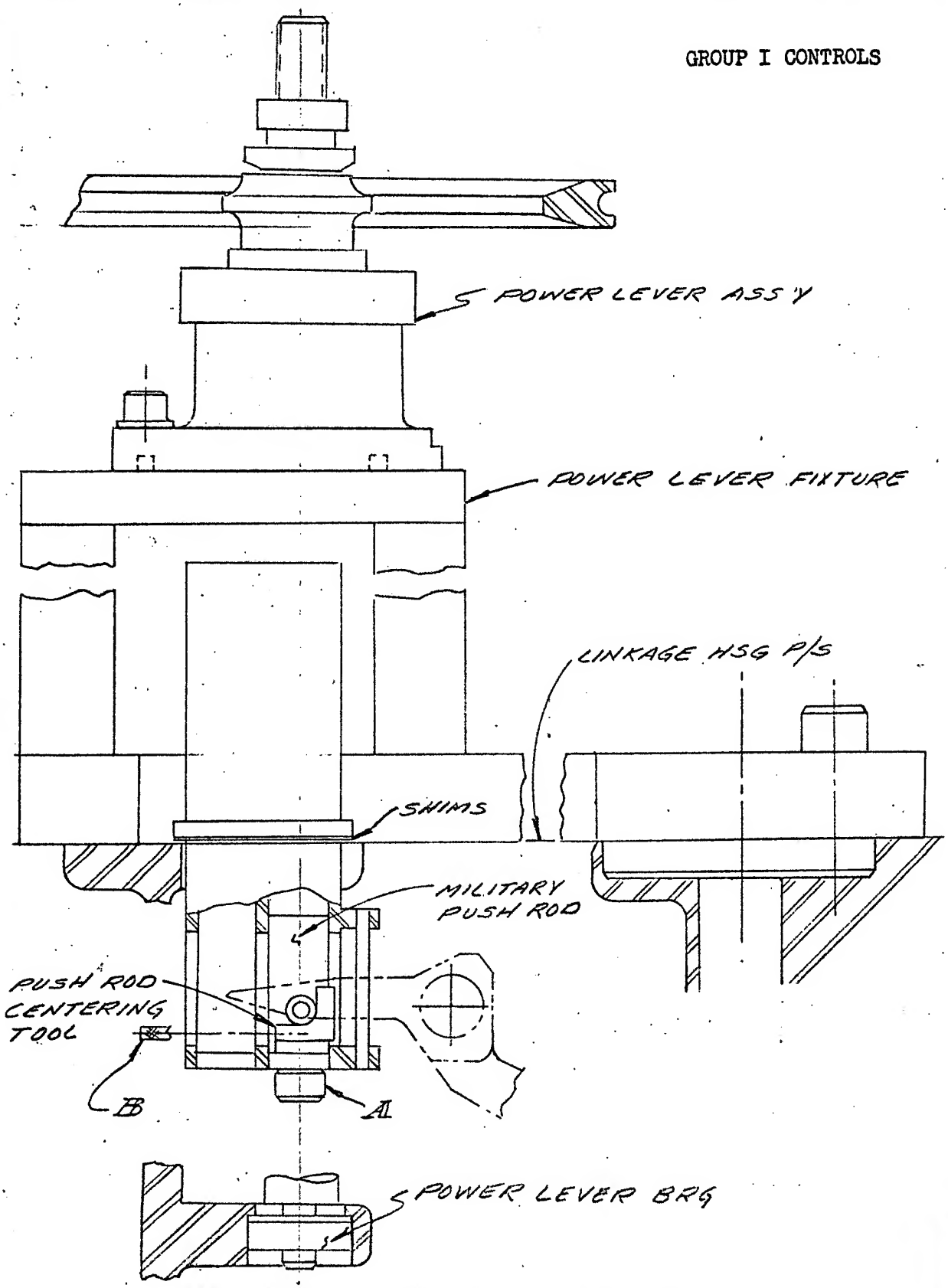
GROUP I CONTROLS



TRIMMER SCREW LOCATING FIXT
& LINKAGE HSG PLATE
569455-T-88

STEP NO.	DESCRIPTION	ASSEM	INSP

GROUP I CONTROLS



MILITARY PUSH ROD CENTERING TOOL 569455-T-89

POWER LEVER FIXTURE 569455-T-95

TITLE: Alignment and shimming of trimmer housing (Group II Controls)

OBJECTIVE: To provide alignment of adjusting screw retainer with servo housing, trim lever roller with idle plunger pin, and trim plungers with droop linkage.

REFERENCE: Sketches and Power Lever Fixture 569455-T-95.

1. To determine required amount of shim between flange on trim plunger housing and servo housing measure following dimensions: Ref. sketch 1.

   a. Distance from servo housing parting face to centerline of trimmer housing clearance diameter. Record as dimension "A".

   b. Distance from centerline of trim adjusting screw retainer (at click-lock end) to linkage housing side of plunger housing flange. Record as dimension "B".

2. Determine required amount of shims by using equation "A"-"A" = "C" when "C" equals required amount of shims. Record dimension "C".

   The purpose is to center the adjusting screw retainer in the clearance hole in the servo housing.

3. After determination of amount of shims required in step 2 install mil trimmer housing assembly and shims onto linkage housing. The trimmer housing must be positioned on its mounting surface to accomplish the following: Ref. sketch #2.

   a. Set the trimmer lever roller center line .001 to .005 below (toward plunger) the centerline of the trim platform pin in the IDLE trim plunger with power lever at idle position. (Note: Tolerance is ±.005 on center distance on plunger and on location of roller in lever).

   b. Place the O.D. of the trim screw retainer in the center of the clearance hole in the servo housing. (Note: Shims locate housing in one direction only.)

   c. Position the centerline of the mil and idle trim plungers 1.170 ± 005 from ℄ of T2 servo datum plane to provide proper relationship between trimmers and droop linkage. This may be done by using a .013 spacer between the machined flat on the trim plunger housing and the support lug on the linkage housing.

4. After trimmer housing assembly has been properly positioned on the linkage housing, tighten four mounting bolts (normal torque) and lockwire.

Title: Shimming of military and idle pushrod assemblies.

Objective: To shim the military and idle pushrods to obtain correct Wf/P3 valves.

Reference: Figures titled: Throttle valve fixture 569455T-46

Cam Motion Tool 569455T-55
Power Lever Fixture 569455T-95

5. Insert a nominal amount of shims in each of the trim plunger assemblies (Idle = 040 ref.-Mil = .080 ref.)

6. Using the nominal thickness mil and idle trim cams (dash 1) adjust idle trim screw full CCW and set mil trim screw in midposition (approximately 6 turns from full CCW position). The shimming of the mil and idle plungers must be conducted with the trim cams set at these positions.

7. Install T.V. Fixture 569455T-46 on parting surface of linkage housing (hydraulic side) (2 screws - normal torque) and index dial indicator on Wf/P3 rollers (put droop lever at min. ratio position and set dial indicator to read .057").

8. Install stop-washer and "Spiral-Lock" ring (to prevent Ng cam overtravel) into Ng servo bore, and engage the Cam Motion Tool on to Ng speed servo cam (one screw - normal torque). Rotate cam until indexed dial indicator 569455T-25 on Tt2 piston reads 0.953 (59°F). Set dial indicator stop for this 59°F position.

   Note: Tt2 dial indicator should be indexed by placing the Tt2 reset follower at 0°F end of Ng cam slot and setting 1.025" on dial indicator; or by placing reset follower at 850°F end of Ng cam slot and setting 0.490" on dial indicator.

   An alternate method of setting the 59°F temperature position is to measure the temperature piston-to-linkage housing parting-surface height with the Tt2 reset follower at the 0°F end of Ng cam slot; and then, moving the piston .072" (1.025 - 0.950") towards the linkage housing. Use Tt2 Servo Lock Tool 569455T-96 and one screw (normal torque) to retain the Tt2 servo piston position during shimming operation.

9. Shimming of Idle Trimmer - (Due to the interaction problem, the idle trim plunger must be shimmed before the military plunger.)

   a. Set the power lever to idle position (13° to 15° power lever angle). Rotate power lever slightly each way and check to make sure that power lever cam follower is on constant radius idle flat.

   b. Set Ng cam to idle speed position by inserting correct idle speed gage block into Cam Motion Tool.

      Note: This is accomplished by installing the mounting plate of Cam Motion Tool 569455T-55 on to the mounting flange of the linkage housing (2 screws - normal torque); and while keeping the Tt2 reset follower in the slot detent of the Ng cam, positioning knurled plate flush against mounting plate and tightening lock nut (normal torque). With lock nut set, the knurled plate is pulled back to allow insertion of idle speed gage block and then pushed tight against mounting plate to establish idle speed position. The desired settings for speed and W_F/P_3 for the particular control being assembled must be checked to ensure that correct values are being used. This may be done by checking appropriate paragraphs of wet calibration specification (HS1234 reference).

   c. With temperature servo position, power lever angle and speed servo position maintained per Paragraph 8, 9a, and 9b, check W_F/P_3 roller position on dial indicator indexed per Paragraph 7.

9. (Continued)

d. A correctly shimmed idle plunger should give a roller position which corresponds to desired ratio value as determined from a curve of W_F/P_3 versus roller travel (F4649 reference). For example, wet calibration specification requires 130 W_F/P_3 at 1980 control speed, 59° Tt2 and idle power lever angle. Curve F4649 shows that roller position at 130 WF/P_3 is . Correctly shimmed plunger will place rollers at this position.

e. If the roller travel is incorrect, add or subtract shim in the idle plunger to obtain correct value. Adding shims decreases roller travel. Sensitivity is about .002 roller travel per .001 shim.

10. Shimming of Military Trimmer -

a. Set the power lever to military position (60° to 75°).

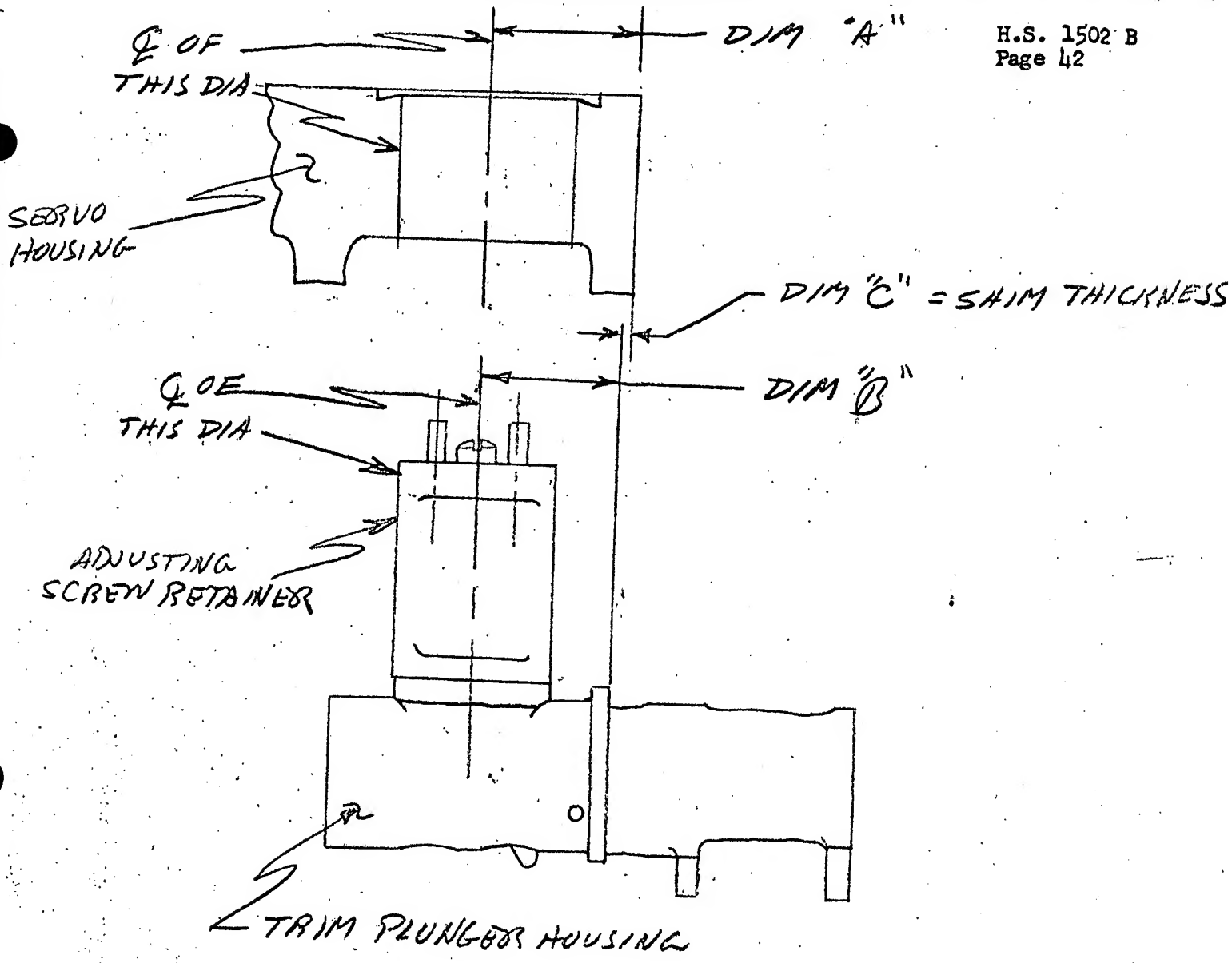
Note: Do not go to maximum power lever angle because power lever cam has contour change at about 110° angle.

b. Set Ng cam to military speed position by inserting correct military speed position by inserting correct military speed gage block into Cam Motion Tool per procedure outlined in Paragraph 9b.

c. With temperature servo position speed servo position and power lever angle maintained per Paragraphs 8, 10a, and 10b, check W_F/P_3 roller position on dial indicator.

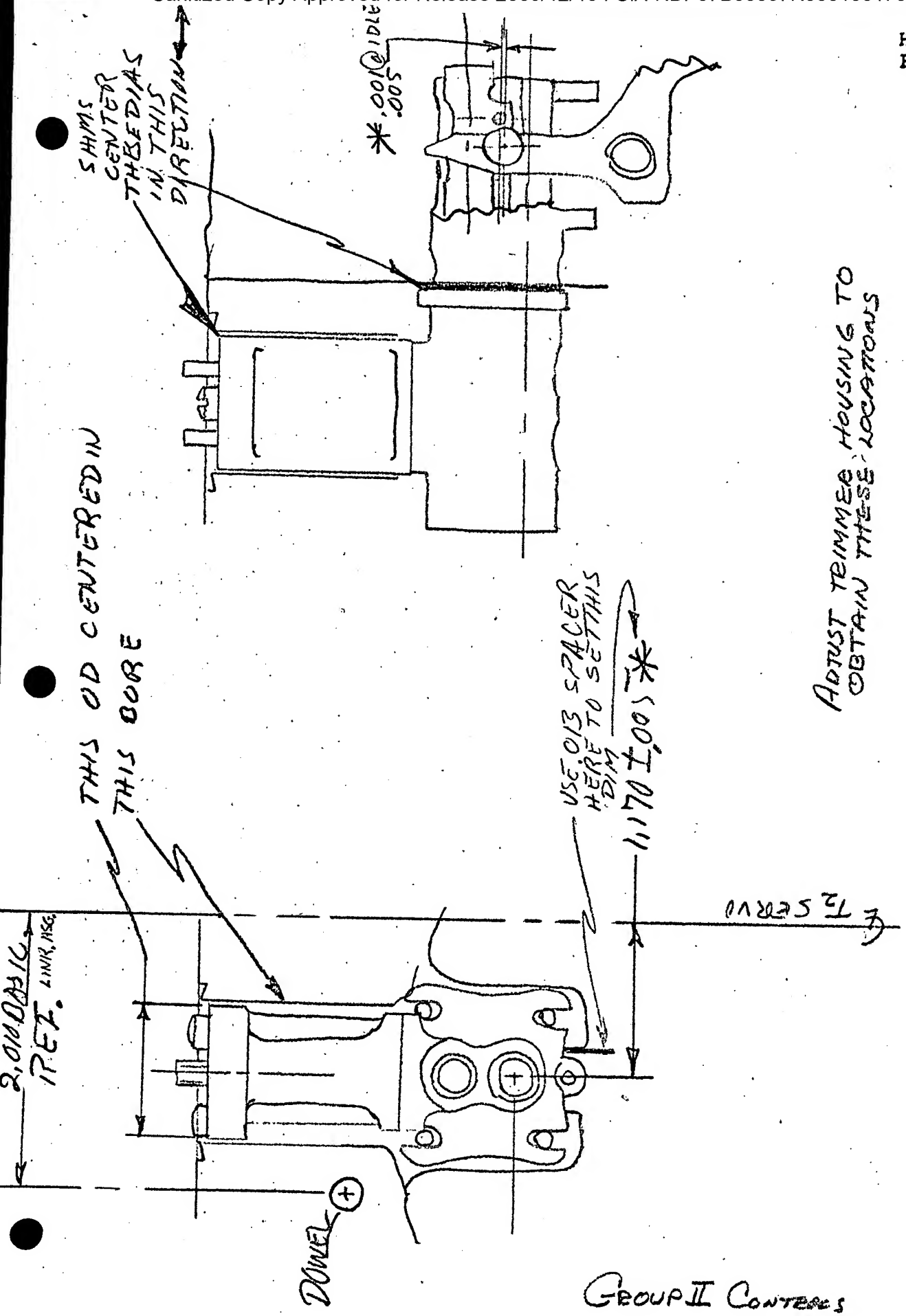
d. A correctly shimmed military plunger should give the desired roller position as defined in Paragraph 9d.

e. If roller travel is incorrect, add or subtract shims in the military plunger to obtain correct value. Adding shims will decrease roller travel. Sensitivity is about .003 roller travel per .001 shim.



GROUP II CONTROLS

SKETCH # 1



GROUP II CONTROLS

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STEP NO.	DESCRIPTION	ASSEM	INSP

TITLE: Shimming of Temperature Cover.

OBJECTIVE: To shim the temperature cover with respect to setting the four contact points of the input system in a straight line.

REFERENCE: Figures Titled: Paralleling Tool 569455-T-75.
Push Rod Adjusting and Shimming Fixture 569455-T-76.

1. Insert Dummy Input Lever of Paralleling Tool into input lever bore of the temperature cover; locate on dowel pin; and install three screws "S" (use normal torque) to retain tool securely on to the temperature cover.

2. Adjust Dummy Input Lever of Paralleling Tool until it contacts the pivot pin "A" in the temperature cover and firmly lock (by hand) the lever in this position with thumb screw "B".

3. Install Compensator Tool into temperature cover and retain securely in place (two screws "T" - normal torque). Adjust movable pin in tool until it contacts the Dummy Input Lever of the Paralleling Tool. Lock the Compensator Tool in this position with set screw "C" - note that no motion of pin occurs when tightening; then, loosen screws "T" and remove preset tool from the temperature cover.

4. Insert Motor Bellows Tool into appropriate end of temperature cover and retain securely in place (three screws "U" - normal torque). Adjust movable pin of tool uhtil it contacts the Dummy Input Lever of the Paralleling Tool. Lock the Motor Bellows Tool in this position with set screw "D" - note that no motion of pin occurs when tightening; then, loosen screws "U" and remove tool from the temperature cover.

5. Mount the control push rod assembly on to the slot on the base plate of the Push Rod Adjusting and Shimming Fixture and secure in place with the clamp and the two screws "E" (use normal torque) provided on the Fixture base plate. Install the adjustable sleeve and screw assembly on to the push rod assembly.

6. Place the preset Compensator Tool into appropriate end plate of the Push Rod Adjusting and Shimming Fixture and secure in place with 2 screws "T" (normal torque). Move the end plate of the fixture until the pin in the Compensator Tool contacts the base plate and tighten thumb screw "F" by hand.

7. Install pin "G" into push rod assembly bore and retain in position by inserting Gage Pin "H" through pin holes in push rod and pin "G". Place block over dowels of end plate and retain in position with two screws "I" (normal torque). Install Nut "J" on to Pin "G" and screw (by hand) until push rod is held in rigid position.

8. Using an Indicating Depth Micrometer, determine gap between Gage Pin "H" and surface of the end plate "Y" _____ record. Add depth micrometer reading to .130" dimension scribed on end of Gage Pin and call the sum DIM. A = _____ record.

9. Group I Controls - Obtain scribed dimension from evacuated diaphragm assembly. (Call it DIM. B = _____ record.) Subtract DIM. A from DIM. B. The result is the amount of shims required between the evacuated diaphragm assembly and the temperature cover housing. Record the shim stack _____.

   Group II Controls - Obtain the scribed dimension from evacuated diaphragm assembly. (Call it DIM. B. = _____ record.) Subtract DIM. A from DIM. B. The result is the amount of spacers required between the evacuated diaphragm assembly and the temperature cover housing. Do not use more than four spacers to achieve this result.

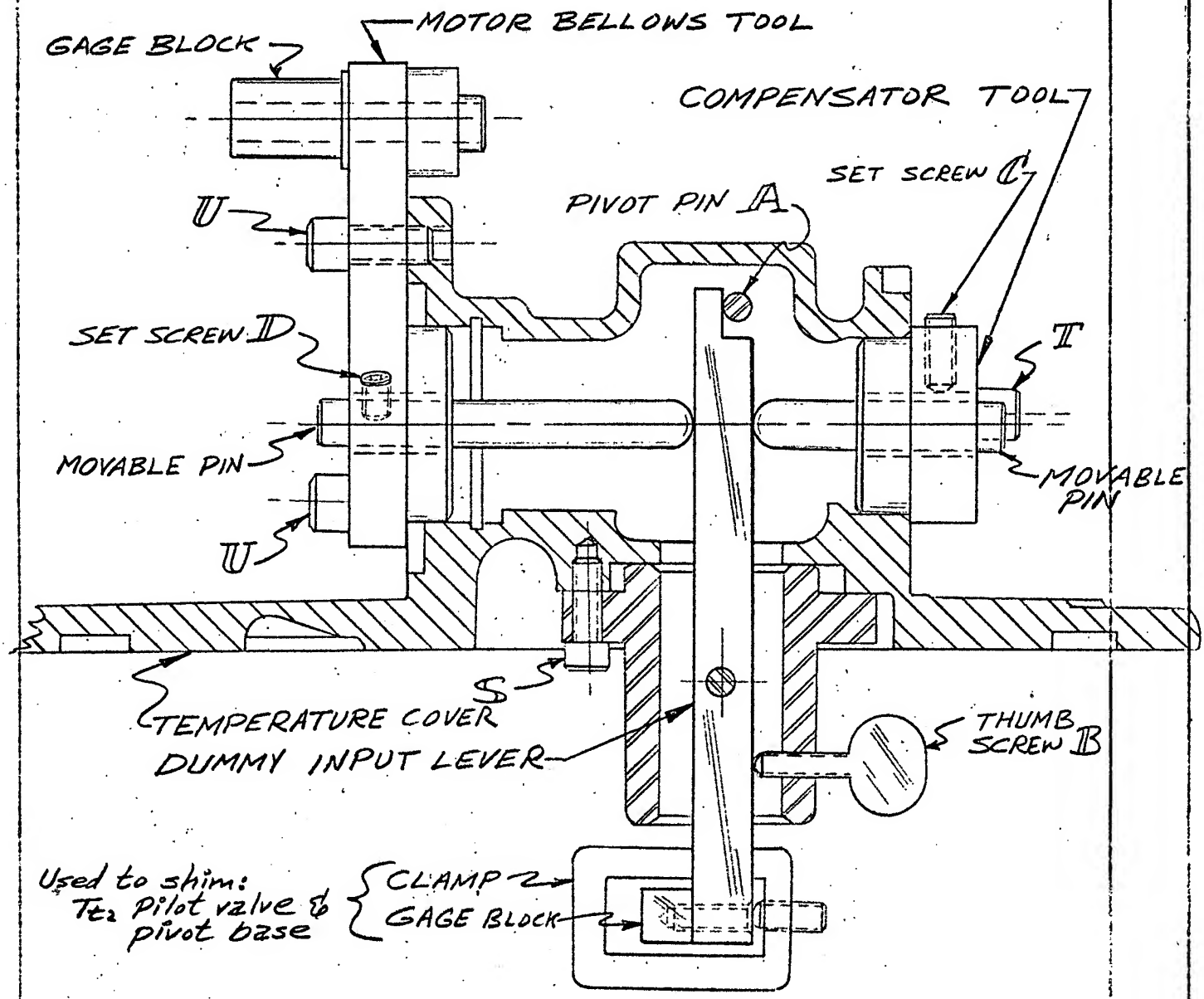
10. Place the preset Motor Bellows Tool into the other end plate of the Push Rod Adjusting and Shimming Fixture and secure in place with three screws "U" (use normal torque). Move the end plate "X" of the fixture until the pin in the Motor Bellows Tool contacts the base plate, and the adjustable sleeve (mounted on the push rod assembly) is centered on the gage block of the Motor Bellows Tool. Tighten thumb screw "K" by hand after making sure that adjustable sleeve does not interfere with positioning of Motor Bellows Tool (i.e., adjust screw "L" in adjustable sleeve CCW).

11. Reach through the access hole of the gage block and adjust the screw "L" in the adjustable sleeve until no gap exists between the adjustable sleeve and the gage block surface. Tighten set screw "M" in adjustable sleeve and lockwire. Clockwise adjustment of screw "L" will decrease any gap between sleeve and gage block surface.

12. Remove adjustable sleeve and push rod configuration from Push Rod Adjusting and Shimming Fixture and install into temperature cover housing in conjunction with the shims (determined in Part 9) under the evacuated diaphragm assembly.

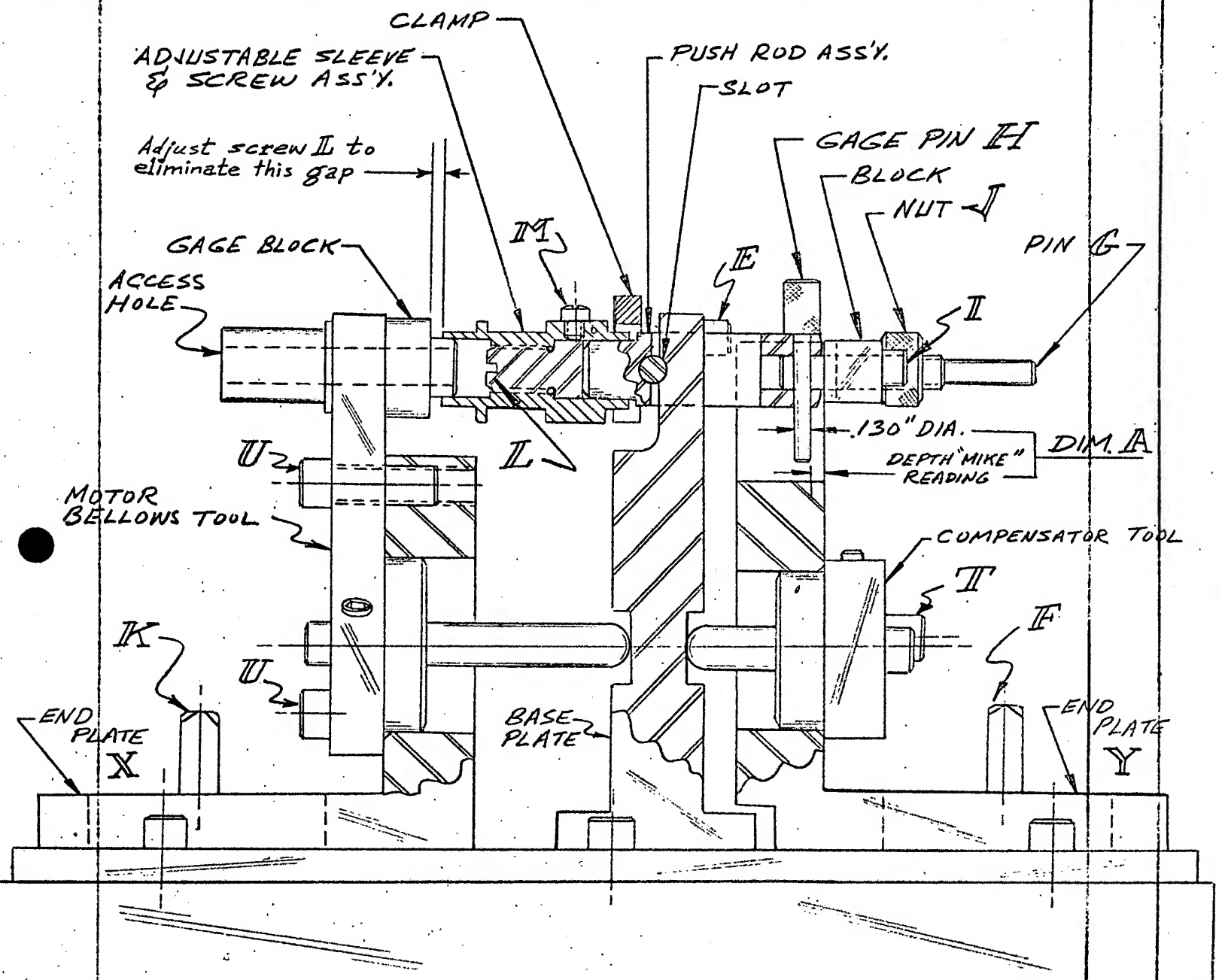
13. Refer to HS1503 specification, Paragraphs 4.2 - 4.2.2 to check shim value and dimension found in Steps 9 and 11 above.

STEP NO.	DESCRIPTION	ASSEM	INSP



PARALLELING TOOL 569455T-75

STEP NO.	DESCRIPTION	ASSEM	INSP



PUSH ROD ADJUSTING & SHIMMING FIXTURE 569455T-76

TITLE: Shimming of Tt2 Pilot Valve

OBJECTIVE: To shim the Tt2 pilot valve for null position.

REFERENCE: Figure #1 with Dummy Lever paralleling tool 569455T-75

1. Install Roller Gage Block (use normal torque on 2 screws X) on to Dummy Input Lever of Paralleling Tool 569455T-75 (still locked in position on temperature cover); and, using Clamp Tool, fasten Tt2 multiplying lever and pivot base assembly onto Roller Gage Block, and Dummy Input Lever to simulate the null condition for Tt2 input linkage. Tighten set screw Y (use normal torque).

2. Next, install the temperature cover into the assembled linkage housing and retain cover on linkage housing by the use of four screws (normal torque).

3. Set up null position (see "S" dimension on match data sheets) on Tt2 pilot valve by inserting correct size drill rod between pilot valve gear and spider housing; and using a feeler gage, determine the gap between pilot valve tip and Tt2 multiplying lever pad. The gap dimension is the amount of shims required beneath the pilot valve tip to establish null position.

   Record the shim stack _____.

4. Remove temperature cover and conduct shimming operation.
   CAUTION: The Tt2 pilot valve tip has left-hand threads.

NB F-298.8

LOG SHEET ASSEMBLY AND TEST OPERATIONS (CONTINUATION) | NO. C- SHEET OF

STEP NO.	DESCRIPTION	ASSEM	INSP

SHIMMING OF T_{T_2} PILOT VALVE

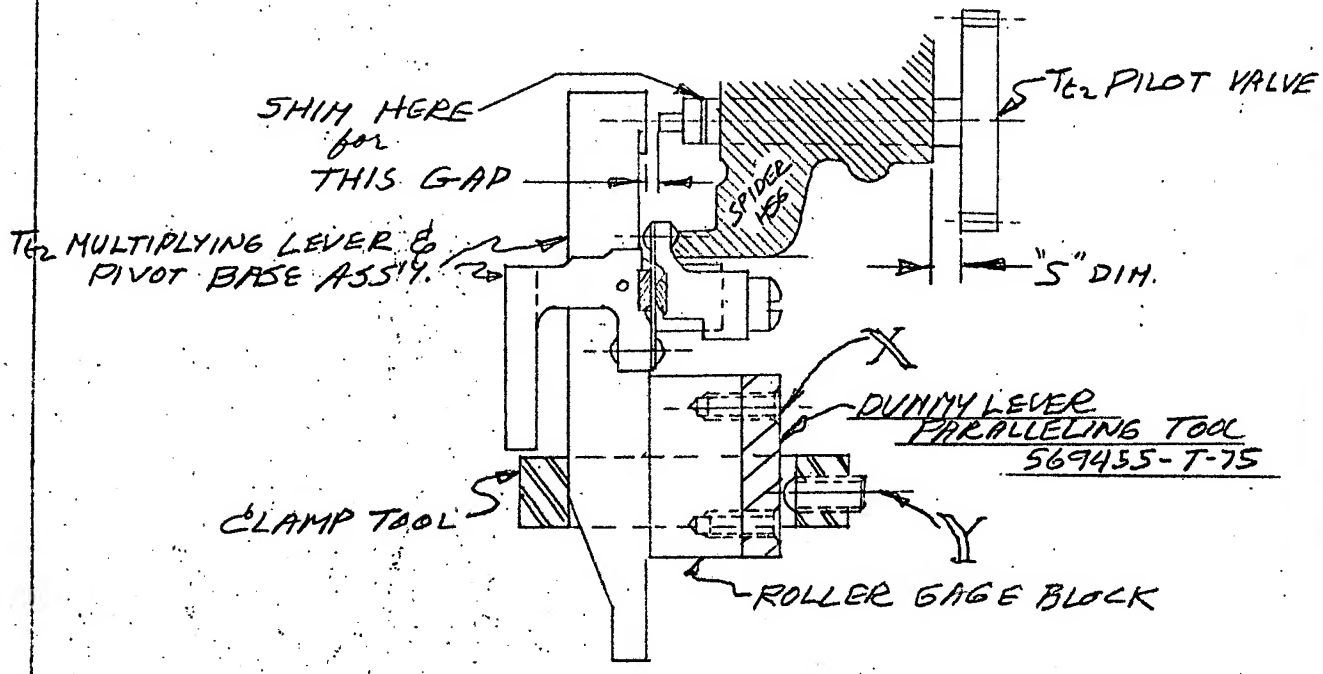


FIGURE I.

HS F-296.7

LOG SHEET ASSEMBLY / TEST OPERATIONS

NO. C-

	ISSUED DATE	REVISIONS A	B	C	D	E	F	G
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PROD. ENG.								
INSP.								

SHEET OF

ALL ITEMS REQUIRE SIGNATURE OF ASSEMBLY/TEST OPERATOR

ITEMS MARKED (*) REQUIRES 100% COVERAGE BY INSPECTION

SUB. ASSY NAME	ASSEMBLY NO.	ASSY. CHANGE LETTER

MAIN ASSY. NO.	MODEL NO.	PARTS LIST NO.	SERIAL NO.

STEP NO.	DESCRIPTION	ASSEM	INSP

TITLE: Shimming of Tt2 Pivot Base

OBJECTIVE: To shim Tt2 pivot base and multiplying lever assembly for null position.

REFERENCE: Figure #1

1. Install Tt2 bracket onto temperature cover previously used to shim the Tt2 pilot valve (i.e. dummy input lever, roller gage block, and Tt2 multiplying lever and pivot base assembly clamped at null position).

2. Use a feeler gage (or the actual shims) to determine the gap between the Tt2 bracket and the multiplying lever pivot base. Care should be taken to insure that the gap measurement is made directly below the pivots in order to prevent the pivot base from "cocking" on its flexures and giving an erroneous shim dimension.

Record shim stack _____.

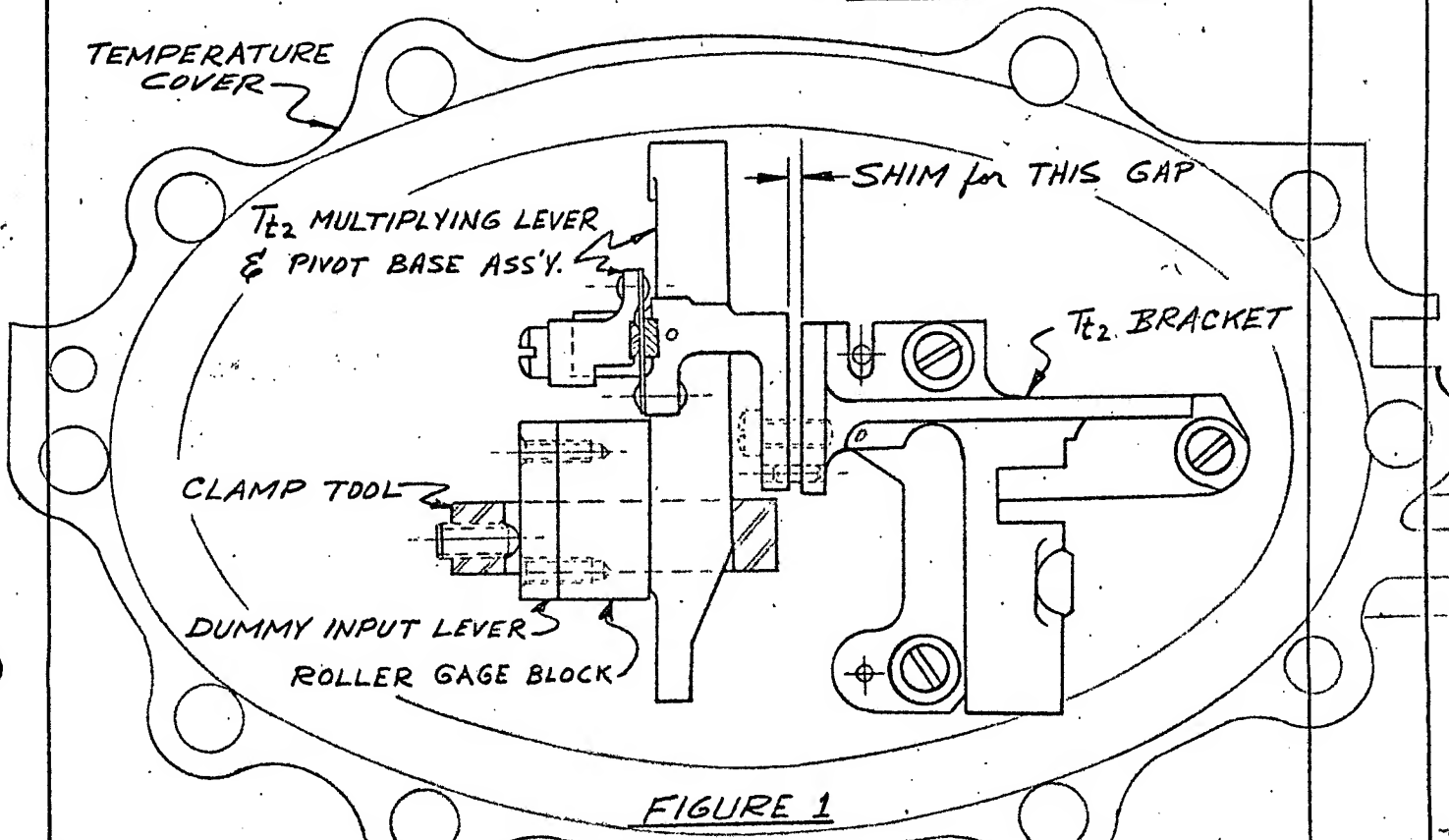

FIGURE 1

HAMILTON STANDARD
DIVISION OF UNITED AIRCRAFT CORPORATION
WINDSOR LOCKS, CONNECTICUT, U. S. A.

SPEC. NO. HS 1502 B
CODE IDENT NO. 73030
PAGE 51 OF

TITLE: Shimming of Tt2 Piston Servo with Adjustable Rack. (Group II Controls Only)

OBJECTIVE: To shim the Tt2 Piston Servo to Provide a Means of Meeting Backlash Requirements

REFERENCE:

1. Assemble piston, servo, and rack plate and solid shim using initial shim .020 shim only.

2. Install above assembly in linkage housing.

3. With Ng cam locked to prevent rotation, measure backlash on piston with indicator gage.

4. Remove rack and piston assembly, disassemble and choose correct shim (shim to limit backlash between Ng servo and rack plate to .001 maximum).

5. Reassemble, install, and recheck backlash. IMPORTANT! Backlash must be checked at both ends of rack and with 3-D cam at both extremes of travel with backlash set as per requirements of .001 maximum. Cam followers must be disengaged from the 3-D cam during the check of 3-D cam and rack for freedom of movement. No tight spots or binding must exist. This motion of the 3-D cam and rack is a combination of horizontal and vertical movements to their extremes.

6. Remove rack and piston assembly and securely fasten, using rivets. Formed HD of rivets must meet envelope requirements (O.D. of rack plate and O.D. of rivet HD and formed HD must not protrude into envelope created by minimum O.D. of piston shank.)

LOG SHEET ASSEMBLY / TEST OPERATIONS

	ISSUED DATE	REVISIONS A	B	C	D	E	F	G
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SHEET 1 OF

ALL ITEMS REQUIRE SIGNATURE OF ASSEMBLY/TEST OPERATOR

ITEMS MARKED (*) REQUIRES 100% COVERAGE BY INSPECTION

SUB. ASSY NAME	ASSEMBLY NO.	ASSY. CHANGE LETTER

MAIN ASSY. NO.	MODEL NO.	PARTS LIST NO.	SERIAL NO.

STEP NO.	DESCRIPTION	ASSEM	INSP

TITLE: Tt2 Rollers Adjustment

OBJECTIVE: To properly locate rollers relative to multiplying lever pivot.

REFERENCE: Figure Titled: Pivot Base Tool 569455-T-81.

1. With Tt2 piston correctly indexed to Ng cam, install sufficient shims beneath the Tt2 roller assembly to obtain .0035-.0015" clearance between the Tt2 roller assembly and the adjacent machined surface of the linkage housing. Record shim stack _____.

2. Install Pivot Base Tool 569455-T-81, (preset by screw A - use normal torque, to "C" dimension scribed on pivot base), on to Tt2 bracket of the temperature cover (in place of Tt2 multiplying lever and pivot base assy.) and retain in place (2 screws B - normal torque).

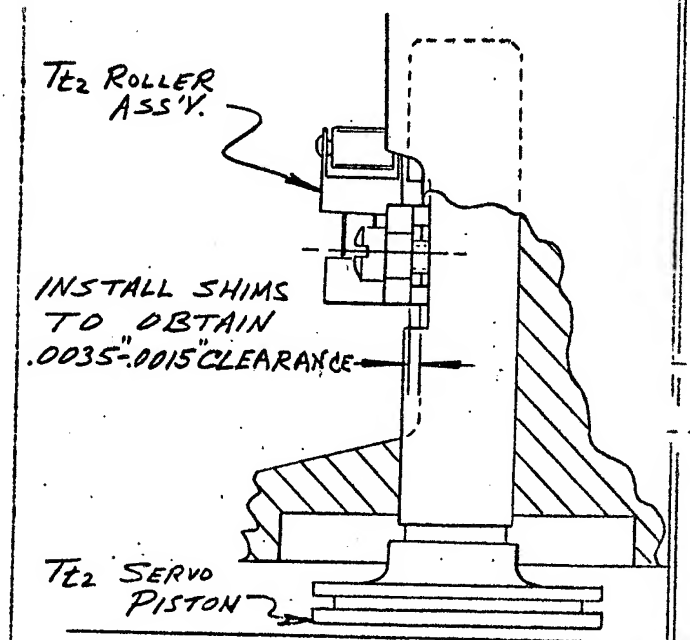
3. Install Tt2 roller assembly on to the Tt2 piston and torque screw C to a "snug" condition. Position the rollers on the piston in such a manner that the rollers will strike the pivot base tool and slide down the Tt2 piston as it is moved to the 850° F position. This procedure of indexing the rollers to the Tt2 piston is required because Tt2 roller assembly screw is not accessible for adjustment after the temperature cover is installed on the linkage housing.

4. Install temperature cover on to linkage housing (use 4 screws - normal torque); and using preset Tt2 Transfer Tool 569455-T-77 and Cam Motion Tool 569455-T-55, move the Tt2 piston towards the 850° F position so that the rollers contact the pivot base tool and slide to an indexing position as the Tt2 Transfer Tool contacts the linkage housing parting surface.

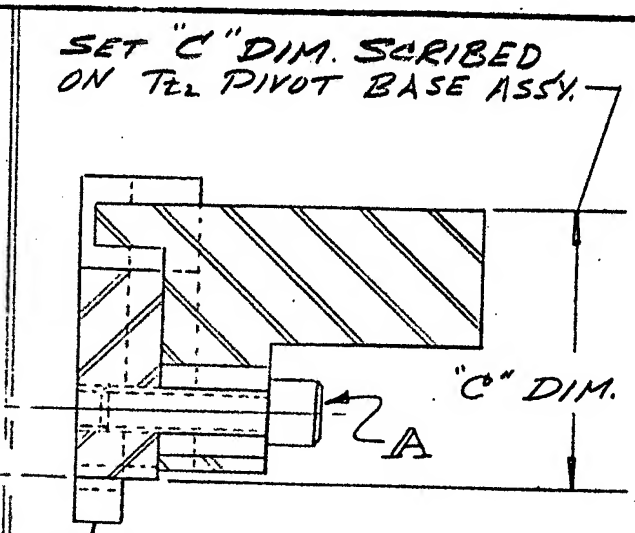
5. Remove temperature cover from linkage housing and lock Tt2 roller assembly (at indexing position) to Tt2 piston by applying the appropriate torque on screw C.

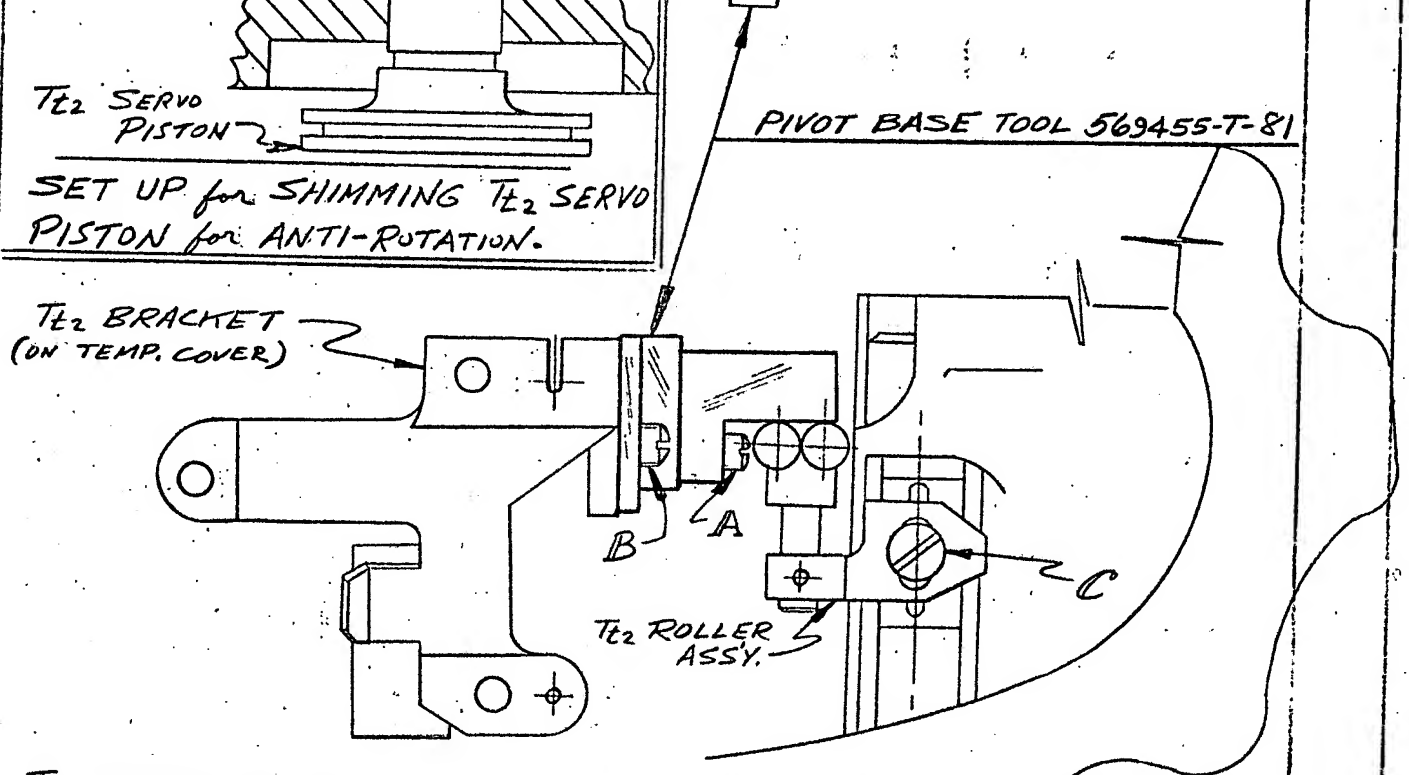
6. Repeat step 4 above to check indexing and reset the roller assembly if indexing is off.

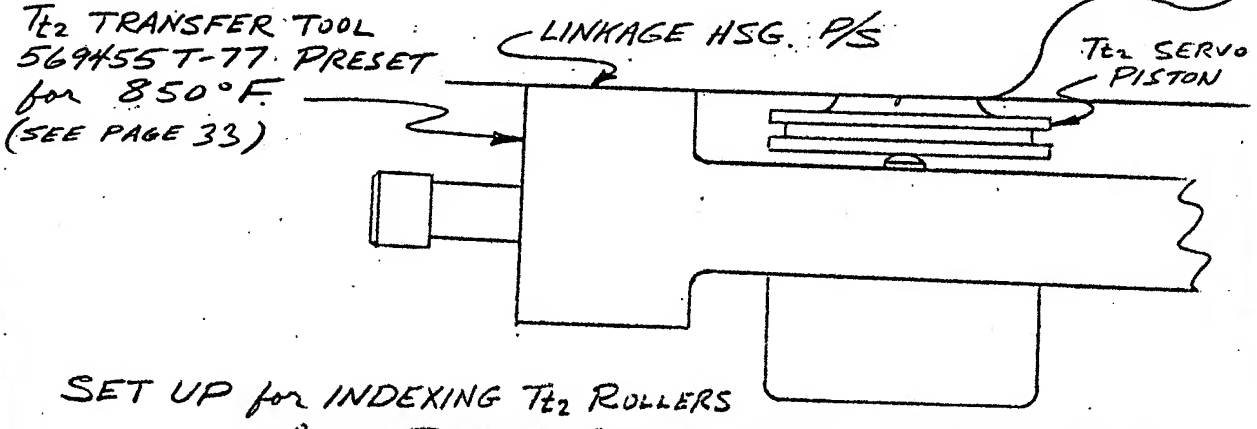
STEP NO. | DESCRIPTION | ASSEM | INS



SET UP for SHIMMING Tt2 SERVO PISTON for ANTI-ROTATION.







SET UP for INDEXING Tt2 ROLLERS using PIVOT BASE TOOL 569455-T-81

LOG SHEET ASSEMBLY / TEST OPERATIONS

NO. C - H.S. 1502 B Page 54

	ISSUED DATE	REVISIONS A	B	C	D	E	F	G
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SHEET . OF

ALL ITEMS REQUIRE SIGNATURE OF ASSEMBLY/TEST OPERATOR

ITEMS MARKED (*) REQUIRES 100% COVERAGE BY INSPECTION

SUB. ASSY NAME	ASSEMBLY NO	ASSY. CHANGE LETTER

MAIN ASSY. NO.	MODEL NO.	PARTS LIST NO.	SERIAL NO.

STEP NO.	DESCRIPTION	ASSEM	INSP

TITLE: Indexing of Proportional Gain Lever Rollers

OBJECTIVE: To properly locate rollers to override lever pivot.

REFERENCE: Figure Titled: Proportional Gain Lever Fixture 569455T-94

1. Assemble proportional gain lever into mounting bracket and retain with hollow pin and wire (X).

2. Install the dissassembled Arm of the Proportional Gain Lever Fixture into the proportional gain lever (in lieu of the roller push rod) and retain with hollow pin and wire (Y).

3. Lower the mounting bracket assembly and Fixture Arm into the servo housing and secure in place with two screws (use normal torque).

4. Insert Gage Pin into the override lever slot of the integrating pilot valve housing bracket and install the integrating P.V. housing into the servo housing (use three screws - normal torque).

5. Install Dummy CIP Cam 569455T-27 into CIP bore of the servo housing and position so that the proportional gain cam follower will contact the 3220 RPM cam position. Dummy cam should incorporate cam retainers as discussed in part 4 page 43.

6. Insert Adjustable Gage Block onto the Fixture Arm and tighten screw "D" lightly.

7. Position Mounting Plate on to parting surface of the servo housing and secure in place with screws "A" and "B" (use normal torque).

8. Engage Fixture Arm with the Mounting Plate and tighten screw "C" (use normal torque) while the proportional gain cam follower contacts the 3220 RPM dummy cam position.

9. Lower the Adjustable Gage Block in the Fixture Arm until it firmly contacts the Gage Pin in the override lever slot of the integrating P.V. housing bracket; and lock the screw "D" in place using normal torque.

10. Remove the two screws that retain the proportional gain lever bracket assembly to the servo housing. Remove screws "A" & "B" from the Mounting Plate and lift the preset Proportional Gain Lever Fixture from the servo housing.

STEP NO.	DESCRIPTION	ASSEM	INSP

11. Place Fixture in an upright position; remove proportional gain lever and bracket assembly; and suspend gain rollers and push rod assembly from preset Fixture Arm by means of hollow pin(Y).

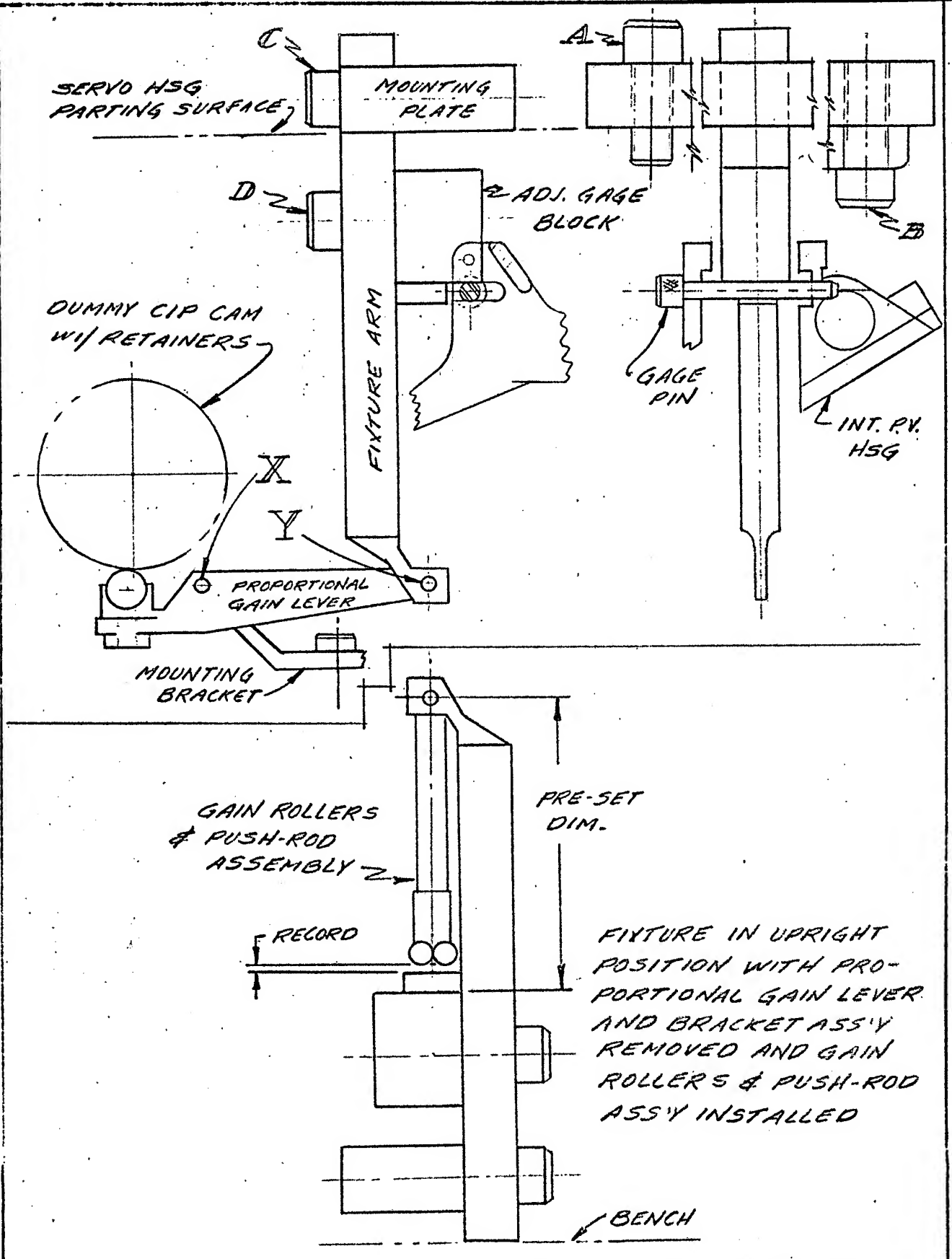
12. Add shims to the roller assembly until the rollers firmly contact the preset Adjustable Gage Block.

Record shim stack = _____.

A. For proportional gain lever which will incorporate the shims beneath the cam follower, use Feeler Gage to determine the gap between the rollers and the Adjustable Gage Block. Record _____. Divide the gap measurement by 3 and add this amount of shims beneath the proportional gain lever cam follower.

Record shim stack _____.

STEP NO.	DESCRIPTION	ASSEM	INSP



PROPORTIONAL GAIN LEVER FIXTURE 569455-T-94

LOG SHEET ASSEMBLY / TEST OPERATIONS

NO. C- 0 51

SHEET 40 OF 59

	ISSUED DATE	REVISIONS A	B	C	D	E	F	G
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PROD. ENG.								
INSP.								

ALL ITEMS REQUIRE SIGNATURE OF ASSEMBLY/TEST OPERATOR

ITEMS MARKED (*) REQUIRES 100% COVERAGE BY INSPECTION

SUB. ASSY NAME	ASSEMBLY NO.	ASSY. CHANGE LETTER

MAIN ASSY. NO.	MODEL NO.	PARTS LIST NO.	SERIAL NO.

STEP NO.	DESCRIPTION	ASSEM	INSP

TITLE: Shimming of Integrating Piston

OBJECTIVE: To control the piston ring groove width by shimming.

REFERENCE: Rigures #1 & #2

1. Shim piston ring groove to obtain a width of .105 ± .002 as follows

   a) Using depth micrometer, measure from end of integrating piston to flange where piston rings will seal. Call this dimension A and record _____. Record other end _____.

   b) Measure thickness of spacer (ref. 575661). Call this DIM. B and record _____. Record second spacer _____.

   c) Shims = (A - B - .105) = _____ Record outboard side.

   = _____ Record inboard side.

NS F-286.0

LOG SHEET ASSEMBLY AND TEST OPERATIONS (CONTINUATION)

NO. C-

SEP NO.	DESCRIPTION	ASSEM	INSP

.105" PISTON RING GROOVE REQ'D.

A

B

SHIMS = A - B - .105

575661 REF.

FIGURE 1

VIEW @ CIRCLE

ADAPTER TOOLING BLOCK

CBA HOUSING MOUNTING SURFACE

SHIMS

FIGURE 2

TITLE: Shimming of Area Linkage System.

OBJECTIVE: To shim the idler lever bracket and the area cam follower so as to place the proportional gain rollers in a parallel position.

REFERENCE: Figure Titled: Area Linkage Speed Transfer Fixture 569455T-26.

1. Determine the available travel of the integrating piston, with spacers but no shims under screws, from the mounting surface of the CBA housing to the bottom of the bore. (See figure 2, sheet 41). Call this dimension "C". Measure the projection of the CBA cover into the integrating piston bore and call this dimension "D". Determine C-D=E. "E", travel of the piston, to equal .727 ± .005 in. after shimming under the screw on CBA cover side of the integrating piston. The difference between "E" and .727 in. is the amount of thickness to be added under the outboard screw. No shims are to be used under the screw toward the bottom of the bore."

2. Install a .342 ± .001 in. spacer block, 569455T, on the CBA side of the integrating piston so that the piston is .342 ±.001 in. from the projection of the CBA cover into the integrating piston bore. Maintain the piston against the spacer block until the area system shimming has been completed."

3. Remove the plate which holds the dial indicator and "jack" screw from Area Linkage Speed Transfer Fixture 569455T-26; and place the fixture on the linkage housing (2 screws - normal torque) so that the adjustable arm will reach into the housing and pick up the area pin on the Ng servo pull rod. Install Cam Motion Fixture 569455T-55 on to linkage housing (2 screws - normal torque); index fixture with Tt2 reset follower in Ng cam detent; and then insert appropriate gage block (corresponding to the L.P. for the low R.P.M. reference marked on C.I.P. dummy cam 569455T-27 to be used per technique discussed in trimmer shimming (page 22 part 20b. Adjust the arm on the transfer fixture so that the area pin fits into the slot of the fixture arm. The fixture is now set so that when transferred to the servo housing, the moveable pin on the arm will simulate the low R.P.M. reference position of the Ng servo. Install the plate holding the dial indicator and "jack" screw configuration back on the Transfer Fixture.

4. Insert a nominal .028" shim under the idler bracket and a .090" shim under the area cam follower and complete the assembly of the area linkage into the servo housing. Install the Area Linkage Speed Transfer Fixture and retain in place on the servo housing (2 screws - normal torque). Install the appropriate cam retainers on CIP Dummy Cam 569455T-27 and insert the drummy cam assembly into the CIP bore of the servo housing using Cam Motion Fixture 569455T -55. Exercise care to prevent cam follower damage of nitrided cam retainers during installation and movement of dummy cam.

Note: The latest version CIP dummy cam is sectioned into three parts:

a. The "front" third contains the two notches which are used to index the area follower with the proportional gain follower.

b. The middle section is recessed to simulate the high R.P.M. reference cam radius and, also, contains a special "saddle" which is to be used to stroke the proportional gain rollers during the initial paralleling operation.

c. The back section of the cam simulates the low RPM reference cam radius. Always install the dummy cam into the CIP bore with the cam retainers in place and the end containing the two notches in first.

5. Install the special sleeve and AN-plug of Fixture 569455T-71 into the transducer housing and mount the transducer on to servo housing. (4 screws - normal torque). Set up the dial indicators of fixture 569455T-71 to pick up the travel of the integrating pilot valve and the transducer piston. Use "jack" screw on Transfer Fixture 459455T-26 to move the paddle of the idler lever.

a. Check transducer and integrating pilot valve dial indicator pickup for repeatability by cycling idler lever between 3220 and 4210 RPM positions.

6. Place dummy cam at the high R.P.M. reference position (with proportional gain follower in line with saddle of cam); and using the cam motion fixture, stroke the dummy cam so that the proportional gain follower ONLY rides up and down the saddle in the middle section of the cam. While stroking cam (to move gain rollers), use "jack" screw to move idler lever to a position where no travel change is noted on transducer piston dial indicator. This places the proportional gain system in a parallel position. Set the dial indicator on the integrating pilot valve to read zero. This zero setting must not be disturbed during the remainder of the calibration procedure; and stroking of the proportional gain rollers should be discontinued. If integrating PV dial indicator is disturbed repeat "zeroing" procedure described above.

7. Move the dummy cam from the high R.P.M. reference position to where the two cam notches will engage with the cam followers. Use the following procedure to be sure that both followers are seated squarely in the notches: Loosen the locking screw on the idler adjusting plates and rotate the dummy cam clockwise until both followers are out of their notches. This will move the area follower to the end of the adjusting slots. Now rotate the cam counterclockwise until the proportional gain follower seats squarely in its notch. To seat the area follower, place the blade of a small screwdriver between the idler bracket and one of the idler lever adjusting plates and lift the follower until the spring load on the follower causes it to seat squarely in its notch. Tighten the locking screw on the adjustment (use normal torque).

Use a .0001 inch indicator to measure indicator to measure integrator pilot

valve motion. After making and securing the position adjustment, note IPV indicator reading. Rotate the dummy cam slightly from this "notch" position in both directions and note IPV motion. If position adjustmentis correct, rotation of the cam in both directions will cause IPV motion in only one direction from the notch reading.

8. Move the dummy cam to the low RPM ref. position and adjust idler lever paddle with "jack" screw until integrating pilot valve dial indicator reads zero as indexed in Part 6. Take reading on dial indicator or which measures the stroke of the idler lever and record. Move the dummy cam to the high R.P.M. reference position and repeat "zeroing" the two measurements. If the stroke difference (at the two Ng speed conditions) does not equal the reference dimension marked on CIP dummy cam 569455T-27, go to figure #1 page 46 to determine whimming correction required. Everytime the idler bracket is raised or lowered by re-shimming, the area cam follower must be re-adjusted using the procedure in Part 7, so that the follower is squarely seated in its notch.

9. After the idler lever stroke has been set to the reference dimension, check the idler lever paddle to Ng pin relationship at either dummy cam speed condition (low or high RPM reference) by using the dial indicator to determine the gap (if any) between lever and pin while the integrating pilot valve dial indicator is reading zero. If there is a gap between lever and pin, it can be eliminated by shimming under the area cam follower. For every .005" at lever-to-pin gap, a .001" shim under the area cam follower will be required (5 to 1 ratio). Movement of the idler lever towards a low speed direction in order to eliminate the gap between the paddle and pin requires the addition of shims to the area cam follower. Movement of the idler lever towards a high speed direction to eliminate the gap requires the removal of shims from the camfollower. If any change is made to the shimming under the area cam follower, the reference stroke of the idler lever must be checked and corrected if necessary.

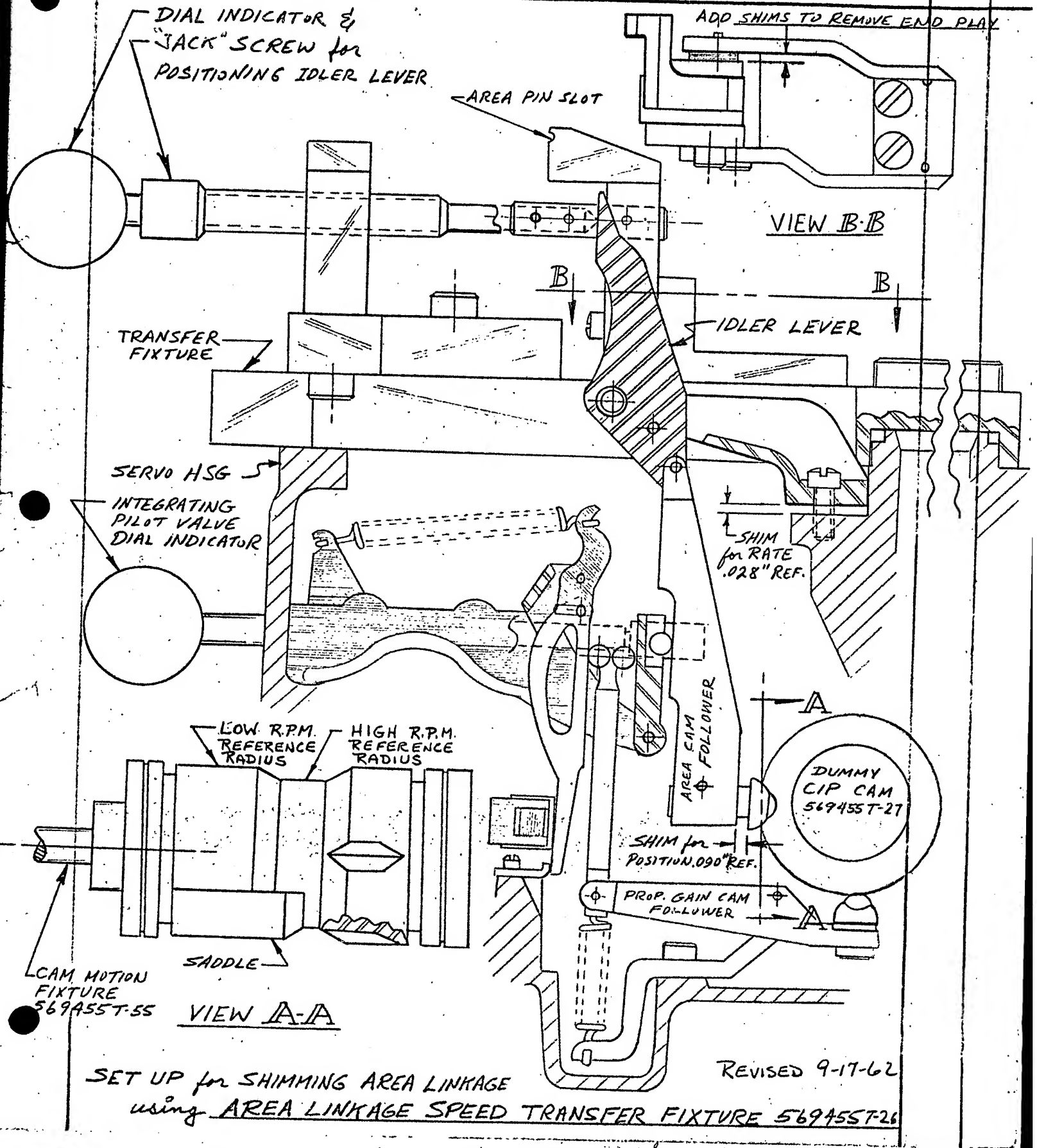
10. After the area linkage system has been shimmed correctly, set the idler lever and dummy cam at their respective low RPM reference positions and then move the idler lever to speed positions of less than and greater than the low RPM reference. Minimum travel (as registered on the transducer piston dial indicator) should be ±.045" from the set speed. Repeat the above with the idler lever and dummy cam at their high RPM reference positions. Min travel of the transducer piston should be ±.045" from the set speed. If less than the required ±.045" travel is observed, a dimensional check of the servo casting and related parts will be required.

11. Add shims to idler lever bracket to prevent intereference of idler lever with Ng pull rod sleeve and to remove "end play". See view B-B,page.

Record shim stack _____.

12. Place Tt2 servo into the fully saturated hot position (.450 L.P.) set speed idler lever to an L.P. position of .1011 (6630 Ne rpm) and stroke CIP servo cam from .340 L.P. to 1.360 L.P. Measure transducer motion for this range of CIP servo travel and it should not exceed .003 maximum. If transducer travel exceeds this limit, recheck shimming.

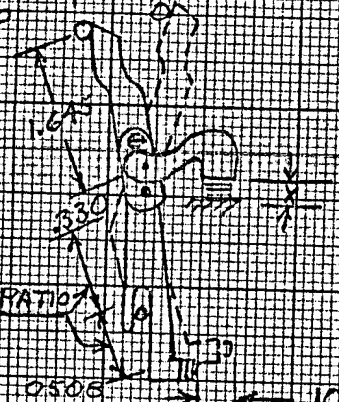
STEP NO.	DESCRIPTION	ASSEM.	INS



SET UP for SHIMMING AREA LINKAGE using AREA LINKAGE SPEED TRANSFER FIXTURE 569455T-26

REVISED 9-17-62

BASED ON
•SBRS
NC DRIVE RATIO
NE



EQUATION $\frac{(.330-X)}{(1.645+X)} = \frac{.100}{A}$

VARY A .450 THRU .550
DETERMINE SHIMS "X"

Δ SHIMS (X) ~ INCHES (REMOVE SHIMS TO INCREASE STROKE)
ADD SHIMS TO REDUCE STROKE

.060
.050
.040
.0376
.030
.020
.010
0

.450 .460 .470 .480 .490 .500 .510 .520 .530 .540 .550

IDLER LEVER STROKE (A) ~ INCHES

EXAMPLE:
1. ASSUME IDLER LEVER STROKE IS .540 AND REFERENCE STROKE IS .515
2. FROM CURVE: (X = +.013")
3. THIS MEANS THAT .013" SHIMS SHOULD BE ADDED BENEATH THE IDLER BRACKET TO REDUCE THE STROKE TO THE ASSUMED .515 REF. STROKE

FIGURE 1

REVISED 9-12-62

EUGENE DIETZGEN CO.
MADE IN U. S. A.

NO. 340 -20 DIETZGEN GRAPH PAPER
20X20 PER INCH

TITLE: Shimming of CIP System

OBJECTIVE: To shim the bellows housing cover, multiplying lever, and CIP pilot valve for a null position.

REFERENCE: Figures Titled: CIP Weight Fixture 569455T-19 and Dummy CIP Sensor Lever 569455T-91.

1. Mount servo housing on Adapter Arm 569445T-14 (4 screws - normal torque). Install the Dummy CIP Sensor Lever into the servo housing (2 screws - use normal torque) along with the multiplying lever mounting bracket, and the CIP pilot valve and housing assembly (which has been preset at the null position by the inclusion of shims between the pilot valve gear-head and housing in the amount defined by the "S" dimension on the match data sheets). Note: CIP pilot valve housing requires positioning in the servo housing with Locating Fixture 569455T-35 which has been preset to the bore (in the linkage housing lug) that retains the CIP shaft.

2. Use small "C" clamp to fasten the CIP multiplying lever assembly on to the Dummy CIP Sensor Lever so as to be aligned with the dowels in the mounting lugs of the servo housing and the bracket.

3. With the multiplying lever locked in this position, use a feeler gage to determine the amount of shims that will be required:

   a. Between multiplying lever pivot bracket and servo housing lug _____ record. Pivots must be in contact.

   b. Between multiplying lever pivot bracket and mounting bracket lug _____ record. Pivots must be in contact.

   c. Between multiplying lever and CIP pilot valve tip _____ record.

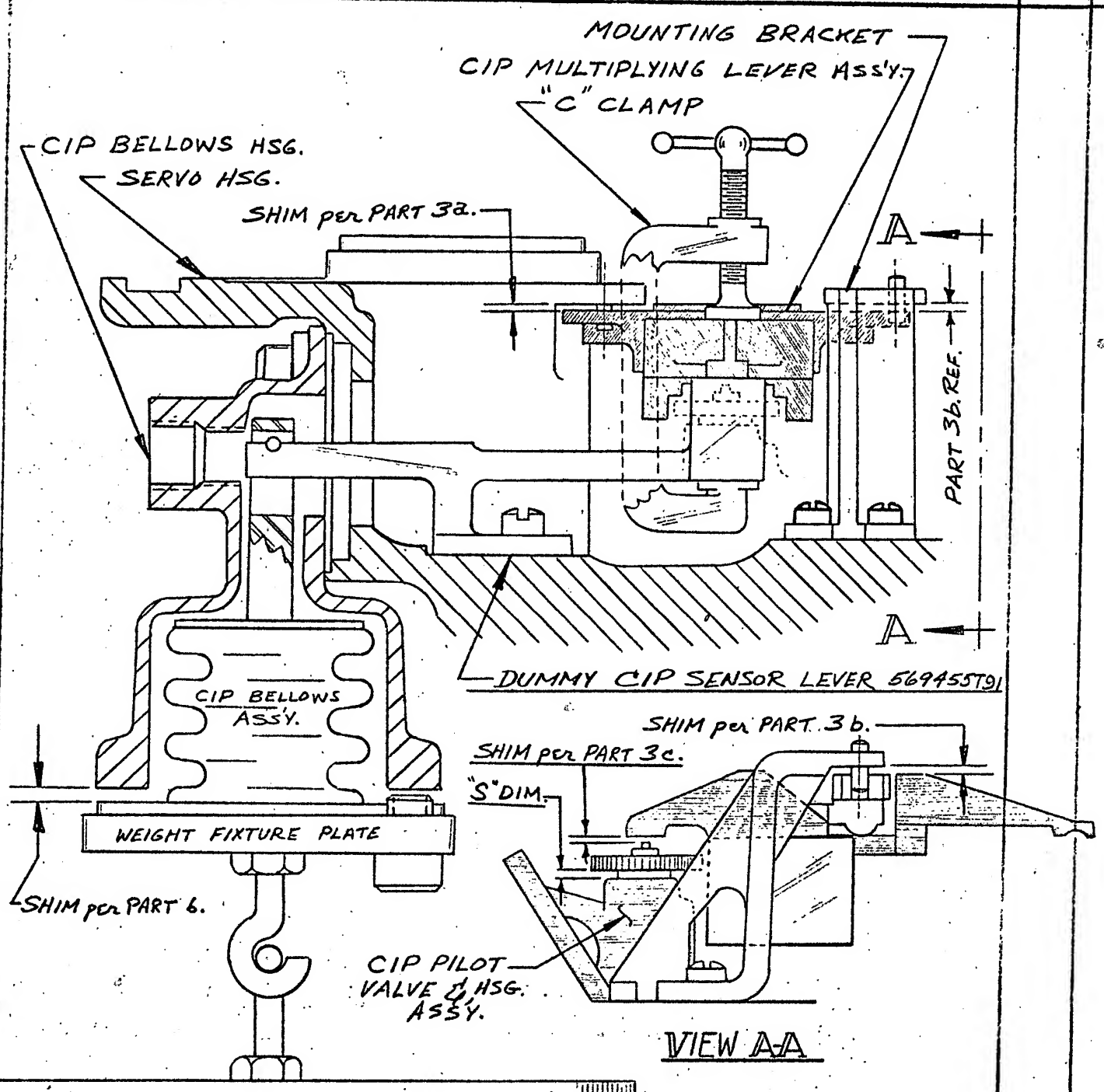
4. Insert the required amount of shims between the multiplying lever pivot bracket and the lugs of the servo housing and mounting bracket, and retain the multiplying lever bracket in place using 2 screws - normal torque.

5. Install C.I.P. Bellows Shimming Fixture Plate to C.I.P. Bellows Header using a nominal amount of shims. Record this amount _____. Use three (3) screws (normal torque) and position C.I.P. bellows assembly in bellows housing. Slide the C.I.P. bellows housing onto the C.I.P. Dummy Sensor Lever (569455-T-91) which protrudes from the servo housing so that the pin in the bellows stem engages the slot in the Dummy Lever. Retain C.I.P. bellows housing to servo housing by using the two (2) top screws only - normal torque.

6. With the bellows assembly pivoting on the Dummy C.I.P. Sensor Lever slot, position C.I.P. Bellows Shimming Fixture (569455-T-19) over the C.I.P. bellows housing and bolt on using the two (2) lower bolt holes of the housing and bolts provided with the fixture. Next screw rod into the plate which is attached to bellows header. Engage hook from Hunter force gage (part of C.I.P. Bellows Shimming Fixture) over pin in rod. Install Indicator Stand (569455-T-28) onto the fixture by means of the tapped hole provided. Position Testmaster Indicator (part of 569455-T-28) so that the indicator point rests on the C.I.P. Bellows Shimming Fixture Plate. Zero out the indicator. Using the adjusting screw of the Fixture, load the Hunter force gage with 13.67 lbs. (read as close as possible). Next, read the Testmaster Indicator. Record this amount _____. This reading is the additional amount of shims to install between the C.I.P. bellows housing and the bellows header.

7. Remove the C.I.P. Bellows Shimming Fixture and the C.I.P. bellows housing from the servo housing. Remove plate from bellows and build up C.I.P. bellows housing using shims recorded in part 6. above.

STEP NO.	DESCRIPTION	ASSEM.	IN



CIP WEIGHT FIXTURE 569455T-19

	ISSUED DATE	REVISIONS A	B	C	D	E	F	G
D								
PROD. ENG.								
INSP.								

SHEET 1 OF

ALL ITEMS REQUIRE SIGNATURE OF ASSEMBLY/TEST OPERATOR

ITEMS MARKED (*) REQUIRES 100% COVERAGE BY INSPECTION

SUB. ASSY NAME	ASSEMBLY NO.	ASSY. CHANGE LETTER

MAIN ASSY. NO.	MODEL NO.	PARTS LIST NO.	SERIAL NO.

STEP NO.	DESCRIPTION	ASSEM	INSP

TITLE: To Position and Shim the C.I.P. Feedback Lever Bracket

OBJECTIVE: To properly locate the C.I.P. feedback bracket with respect to the pull rod sleeve; and to index the C.I.P. feedback linkage by adding shims beneath the feedback bracket.

REFERENCE: Figure Titled: C.I.P. Feedback Bracket Aligning Tool 569455-T-79

1. With CIP pull rod sleeve retained in the servo housing by 2 screws (normal torque), insert the CIP feedback lever bracket on to CIP Feedback Bracket Align. Tool (A) (install pin B) and position the Feedback Fixture in the pull rod sleeve (by means of locating plug C) until the bracket contacts the servo housing.

2. Place scribe mark on bracket and servo housing (to define fixture location) and remove Fixture and bracket assembly from pull rod sleeve. Remove Fixture and install feedback lever and pin to bracket.

3. Install the CIP cam and pull rod assembly (with trunnion pin in place) into servo housing along with push rod and roller assembly, spring retainer and spring. Insert feedback lever (with bracket attached) into trunnion pin and connect the other end to the push rod and roller assembly.

4. Set the CIP cam at "zero" L.P. (place area cam follower in 850° F. detent) and insert Rigging Pin 569455-T-16 in appropriate slot in CIP multiplying lever assembly by compressing push rod (against spring) until hole in rod matches with slot in multiplying lever.

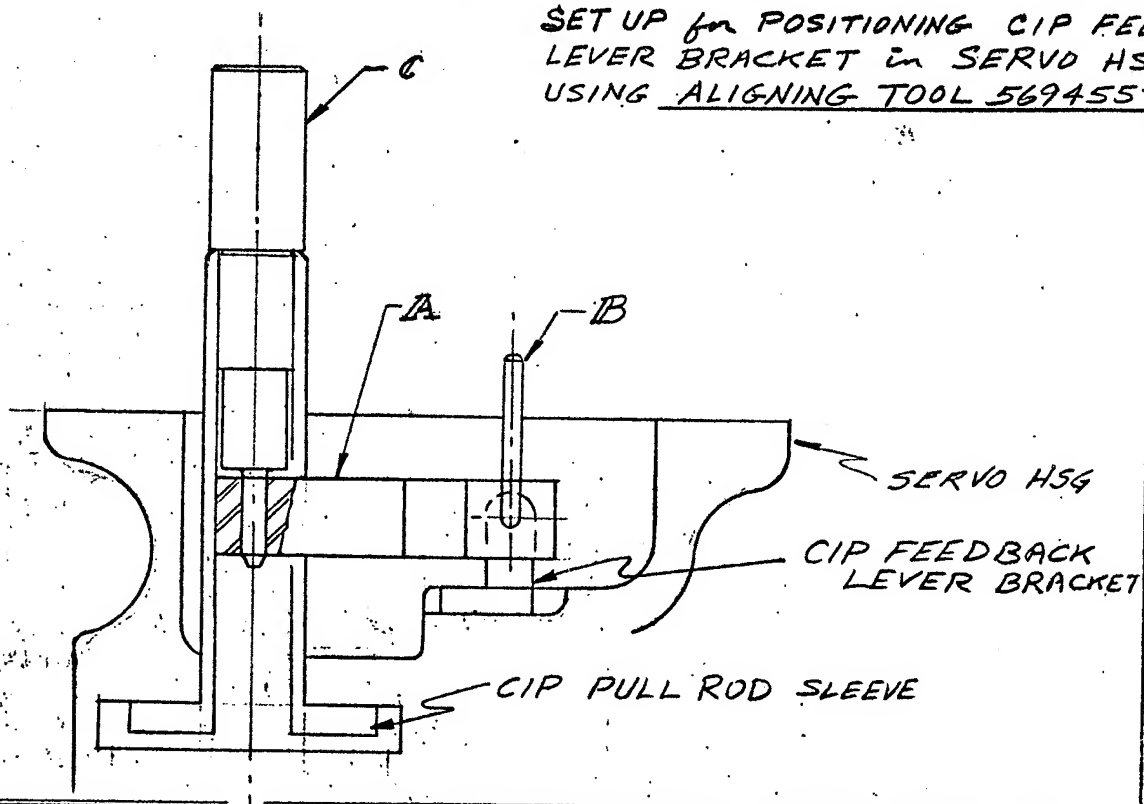
5. With feedback linkage retained at conditions described in part 4, determine the amount of shims required to fill the gap between the base of the bracket and the mounting surface on the servo housing by sliding various shim stacks between the two surfaces.

   Record shim stack = _____.

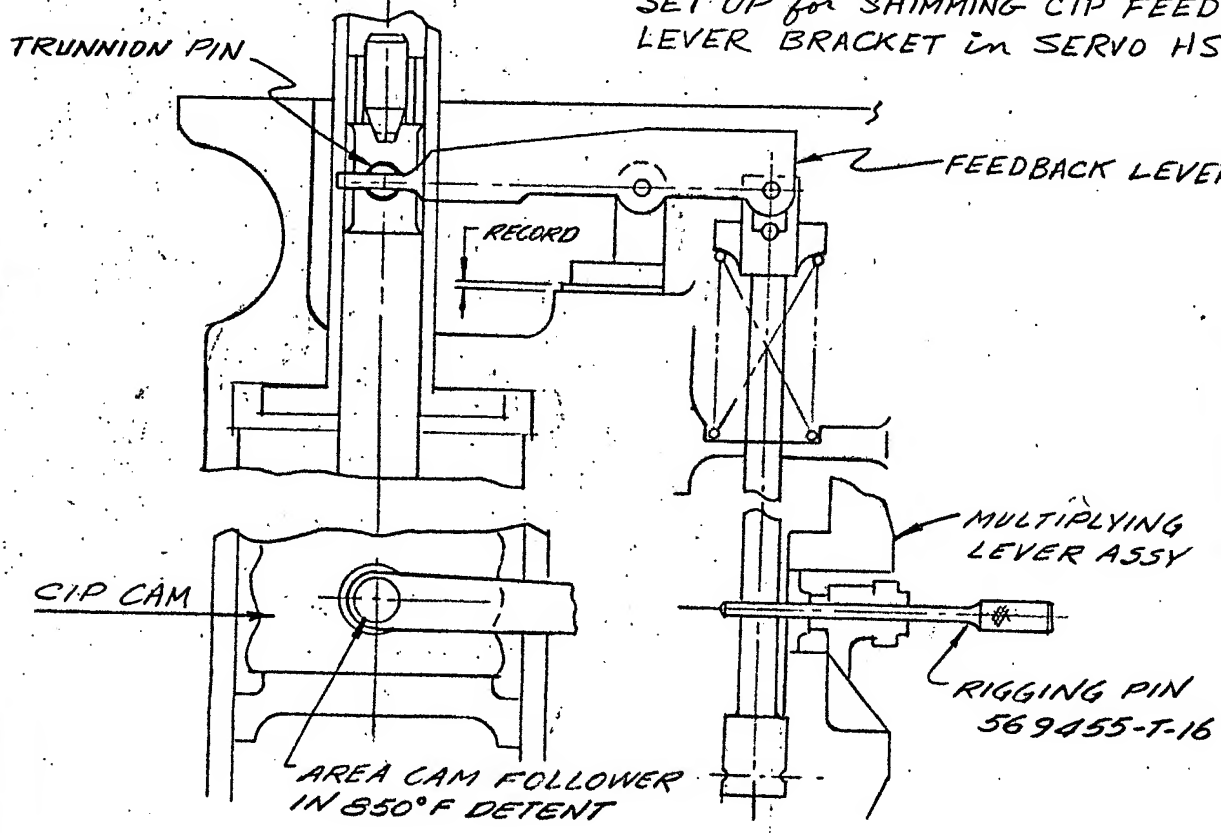
6. After shims are in place and the bracket is aligned to the scribe marks and secured in place (2 screws normal torque), remove the rigging pin while the CIP cam is still at "0" L.P. The push rod must not move. Check by replacing rigging pin for alignment.

STEP NO.	DESCRIPTION	ASSEM.	IN

SET UP for POSITIONING CIP FEEDBACK LEVER BRACKET in SERVO HSG. USING ALIGNING TOOL 569455T-79



SET UP for SHIMMING CIP FEEDBACK LEVER BRACKET in SERVO HSG.



C.I.P. FEEDBACK BRACKET ALIGNING TOOL 569455-T-79

HS F-298.7

LOG SHEET ASSEMBLY / TEST OPERATIONS

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	ISSUED DATE	REVISIONS A	B	C	D	E	F	G
DATE								
PROD. ENG.								
INSP.								

SHEET : OF

ALL ITEMS REQUIRE SIGNATURE OF ASSEMBLY/TEST OPERATOR

ITEMS MARKED (*) REQUIRES 100% COVERAGE BY INSPECTION

SUB. ASSY NAME	ASSEMBLY NO.	ASSY. CHANGE LETTER

MAIN ASSY. NO.	MODEL NO.	PARTS LIST NO.	SERIAL NO.

STEP NO.	DESCRIPTION	ASSEM	INSP

TITLE: To Set the C.I.P. Stop

OBJECTIVE: To position the CIP pull rod stop to bottom against the servo-stop cover at "zero" L.P. condition.

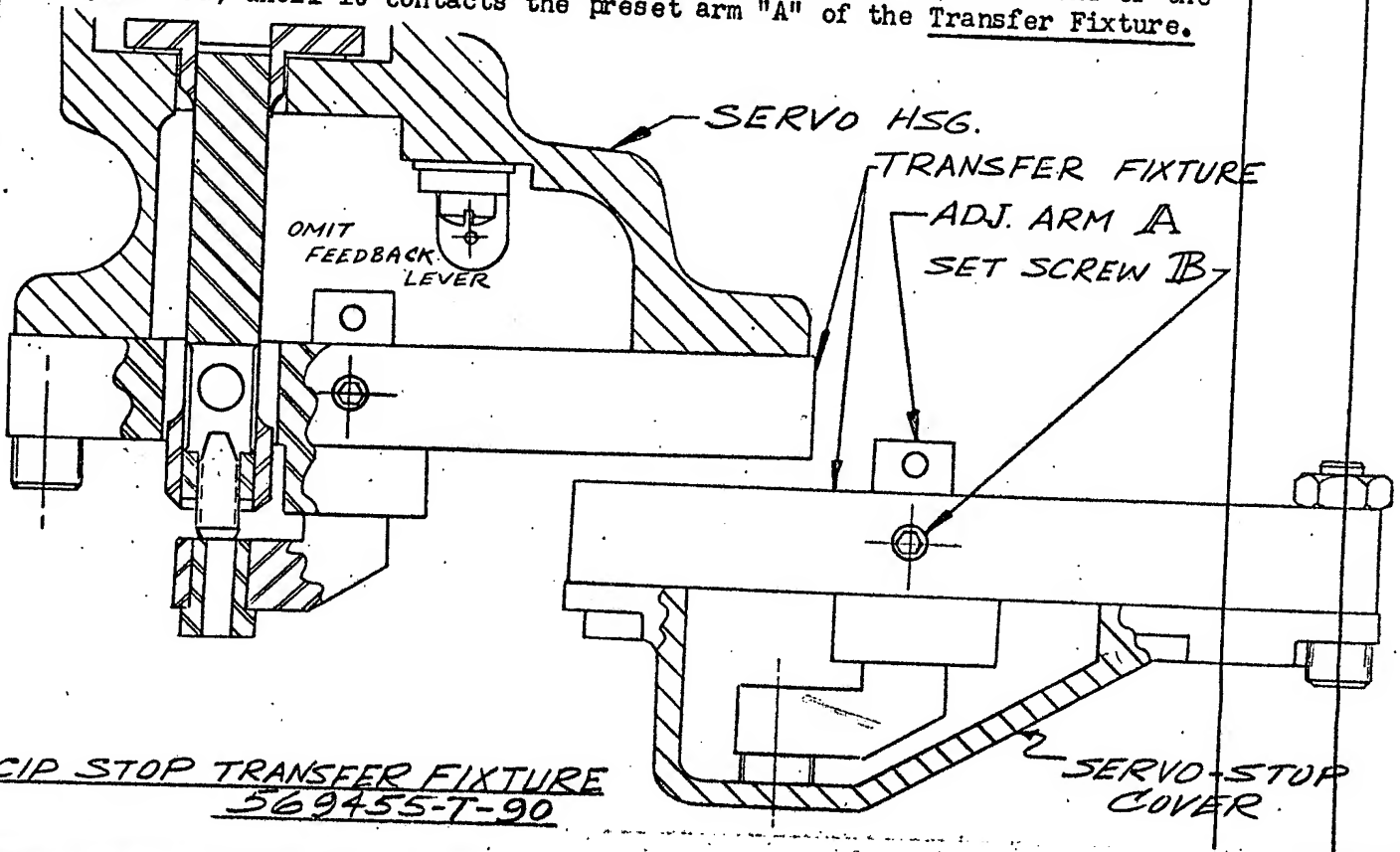
REFERENCE: Figure Titled: CIP Stop Transfer Fixture 569455T-90

1. Install CIP servo-stop cover on to CIP Stop Transfer Fixture and bolt securely using four bolts and nuts (normal torque).

2. Move adjustable arm "A" of Transfer Fixture until it contacts the inside surface of the servo-stop cover, and then lock set screw "B" (use normal torque) while making sure that the adjustable arm does not move.

3. Remove the servo-stop cover from the Transfer Fixture and place the preset Transfer Fixture on to the servo housing using four screws (normal torque).

4. Set the CIP cam at "zero" L.P. (place area cam follower in 850° F detent) and while holding this position, adjust the set screw (in the end of the pull rod) until it contacts the preset arm "A" of the Transfer Fixture.



CIP STOP TRANSFER FIXTURE 569455-T-90

LOG SHEET ASSEMBLY / TEST OPERATIONS

NO. C -

	ISSUED DATE	REVISIONS A	B	C	D	E	F	G
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SHEET OF

ALL ITEMS REQUIRE SIGNATURE OF ASSEMBLY/TEST OPERATOR

ITEMS MARKED (*) REQUIRES 100% COVERAGE BY INSPECTION

SUB. ASSY NAME	ASSEMBLY NO.	ASSY. CHANGE LETTER

MAIN ASSY. NO.	MODEL NO.	PARTS LIST NO.	SERIAL NO.

STEP NO.	DESCRIPTION	ASSEM	INSP

TITLE: Power Lever Shimming

OBJECTIVE: To shim bearing in power lever housing to minimize "end Play".

REFERENCE: Figure 1

1. Position bearing against shoulder of power lever housing; and use depth micrometer to measure from top of bearing to housing parting surface. Call measurement DIM. B
and record _____.

2. Measure from top of stop plate to the bottom of the counterbore (in stop plate) which will retain bearing. Call measurement DIM.A and record _____.

3. Use formula (Shims = A. - B) to compute required amount of shims _____ record.

4. It is permissible to shim from line on line to .003" loose fit between stop plate and the bearing.

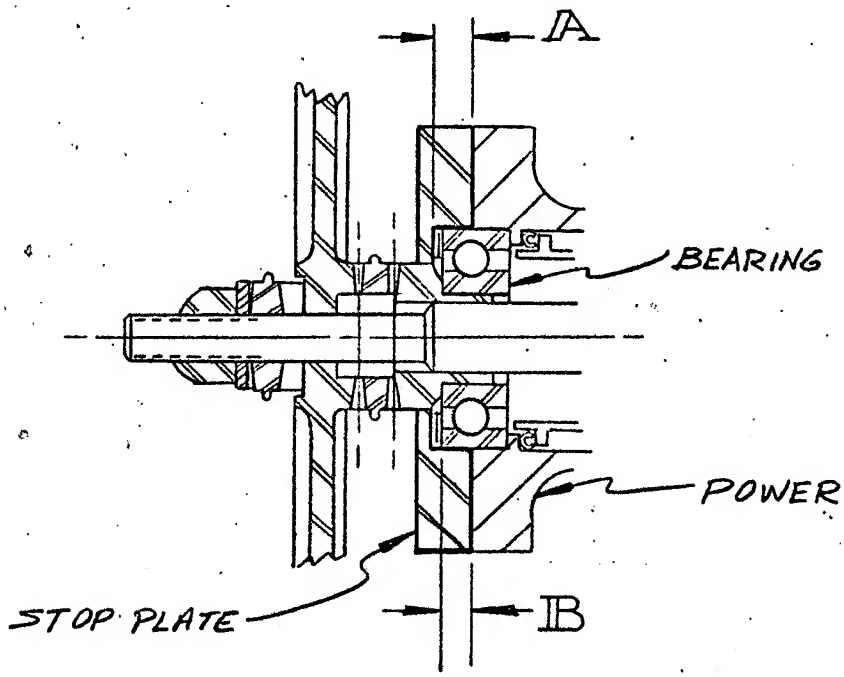

FIGURE 1

TITLE: Shimming of Transducer Pilot Valve. (Group I controls only. No shimming required on Group II controls)

OBJECTIVE: To shim the transducer valve to provide a proper signal to the ENC

REFERENCE: Figures #1 and #2

1. Proper shimming of the transducer valve can be accomplished, only, during rig calibration.

2. It is imperative, however, that the person doing the shimming be aware that the pin in the transducer sleeve should always be aligned with the proper slot (in the transducer housing) which is "in-line" with the external pressure balance tube. There are two machined wall "break throughs" approximately 90° each way from the correct pin slot that may be mistaken for slots.

3.0 The transducer assembly is to be built with a nominal stack-up of .100.

	ISSUED DATE	REVISIONS A	B	C	D	E	F	G
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SHEET 1 OF

ALL ITEMS REQUIRE SIGNATURE OF ASSEMBLY/TEST OPERATOR

ITEMS MARKED (*) REQUIRES 100% COVERAGE BY INSPECTION

SUB. ASSY NAME	ASSEMBLY NO.	ASSY. CHANGE LETTER

MAIN ASSY NO.	MODEL NO.	PARTS LIST NO.	SERIAL NO.

STEP NO.	DESCRIPTION	ASSEM	INSP

TITLE: Shimming of Transducer Pilot Valve.

OBJECTIVE: To shim the transducer valve to provide a proper signal to the ENC

REFERENCE: Figures #1 and #2

1. Proper shimming of the transducer valve can be accomplished, only, during rig calibration.

2. It is imperative, however, that the person doing the shimming be aware that the pin in the transducer sleeve should always be aligned with the proper slot (in the transducer housing) which is "in-line" with the external pressure balance tube. There are two machined wall "break throughs" approximately 90° each way from the correct pin slot that may be mistaken for slots.

FIGURE 1.

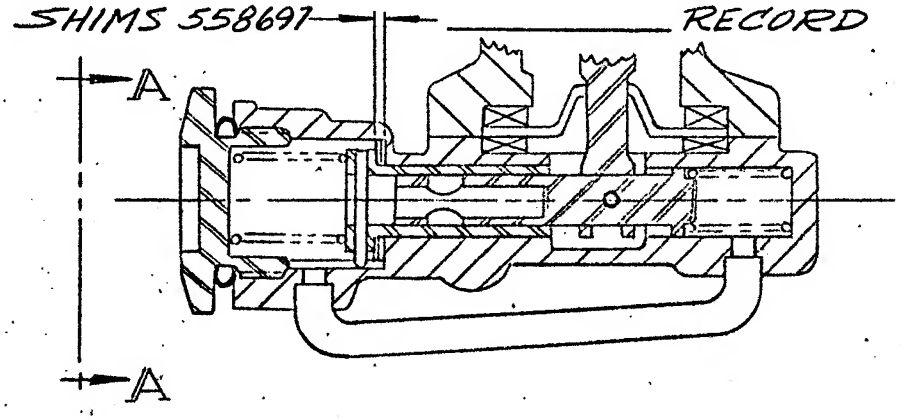
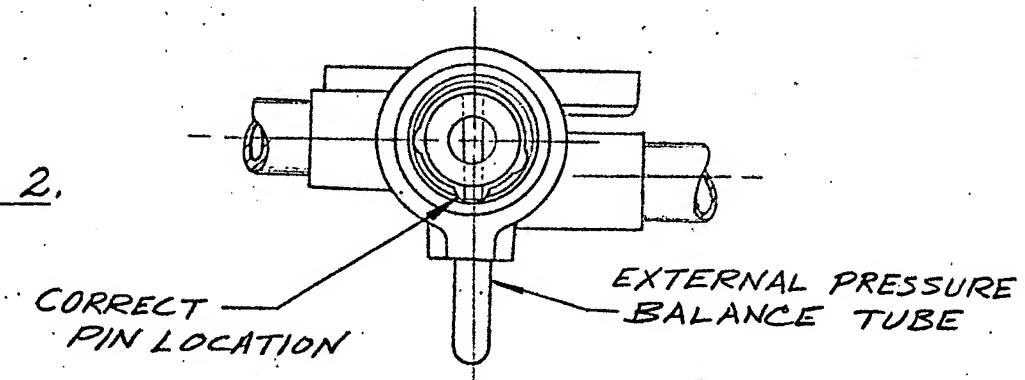


FIGURE 2.



VIEW A-A (MINUS AN PLUG)

TITLE: Indexing of Tt2 Servo Piston Adjusting Screw

OBJECTIVE: Adjusting Screw indexes two halves of Tt2 servo into proper relationship with each other.

REFERENCE: Figure Titled: Tt2 Transfer Tool 569455T-77

1. Position linkage housing half of Tt2 piston so that the Tt2 reset lever ball follower falls into 850°F end of the slot detent of the Ng Cam (push in on piston toward linkage housing parting surface).

2. Insert appropriate end of Tt2 Transfer Tool onto the Tt2 bore of the linkage housing; secure in place (4 bolts B, & nuts C) using normal torque; and loosen screw A to allow plug of Transfer Tool to make contact with insert in Tt2 piston of linkage housing. Lock screw A in this position (use normal torque).

3. Set up the area jack screw fixture T26, previously adjusted in "shimming of area linkage" sheet 42, on the parting face of the servo housing. Index the area paddle lever dial indicator at zero with the area pin simulator in the low speed position. Turn jack screw to move the area paddle .556" in the increasing speed direction. With the area paddle in this position place the area follower in the CIP cam detent. With these conditions set up measure and record the dimension from the indicator mounting surface on the servo housing to the end of the Tt2 piston.

4. Remove the area fixture and place the preset temperature transfer fixture over the Tt2 bore of the servo housing.

5. Adjust the screw until the dimension obtained in part 3 is established. Make sure the Tt2 piston is loaded against the fixture and shims.

TITLE: Shimming of P.R.V. Fail-Safe Relief Valve

OBJECTIVE: To Set the Opening Point of the P.R.V. Relief Valve

REFERENCE: Figure Titled: Ball Check Valve Fixture 569455T-97

1. Lightly lap the valve to the hydraulic housing seat.
   (a) A continuous circumferential land on the valve seat should be noted (about .001" wide).

2. Thoroughly clean all parts.

3. Install the P.R.V. check valve, retainer and spring into the hydraulic housing and secure with Tru-arc ring.

4. Place "O" seal on Ball Check Valve Fixture and install Fixture into P.R.V. bore. Secure Fixture to hydraulic housing by inserting 3 screws through the fixture flange plate (normal torque). Adjust Fixture Plug until bottomed in P.R.V. bore and tighten lock nut (use hand torque).

5. Connect the Ball Check Valve Fixture to a source of air pressure (0 to 50 psig) with an attached air pressure gage.

6. While listening to the relief valve bore and observing the air gage, slowly increase the air pressure to the Fixture. The relief valve cracking pressure is characterized by a sudden expulsion of air from the relief valve bore and an approximate 1 psig pressure drop-off on the air gage.

7. Add (or remove) shims from the check valve spring until it takes a pressure of 21 to 24 psig to unseat the check valve.

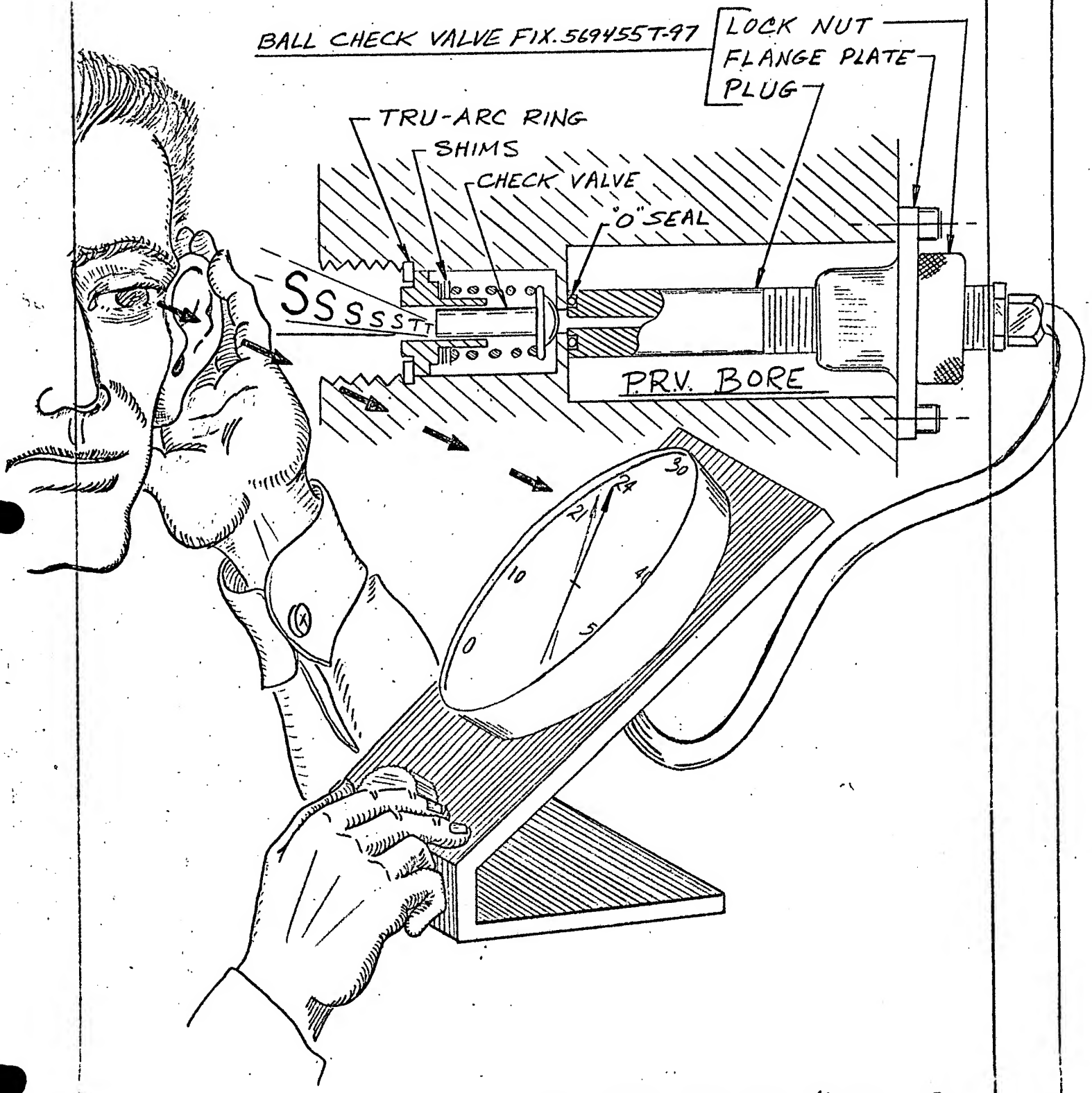
   Record shim stack _____

8. With check valve properly shimmed, check the total valve travel (from seat to stop), which should be .020" min.

   Record travel _____

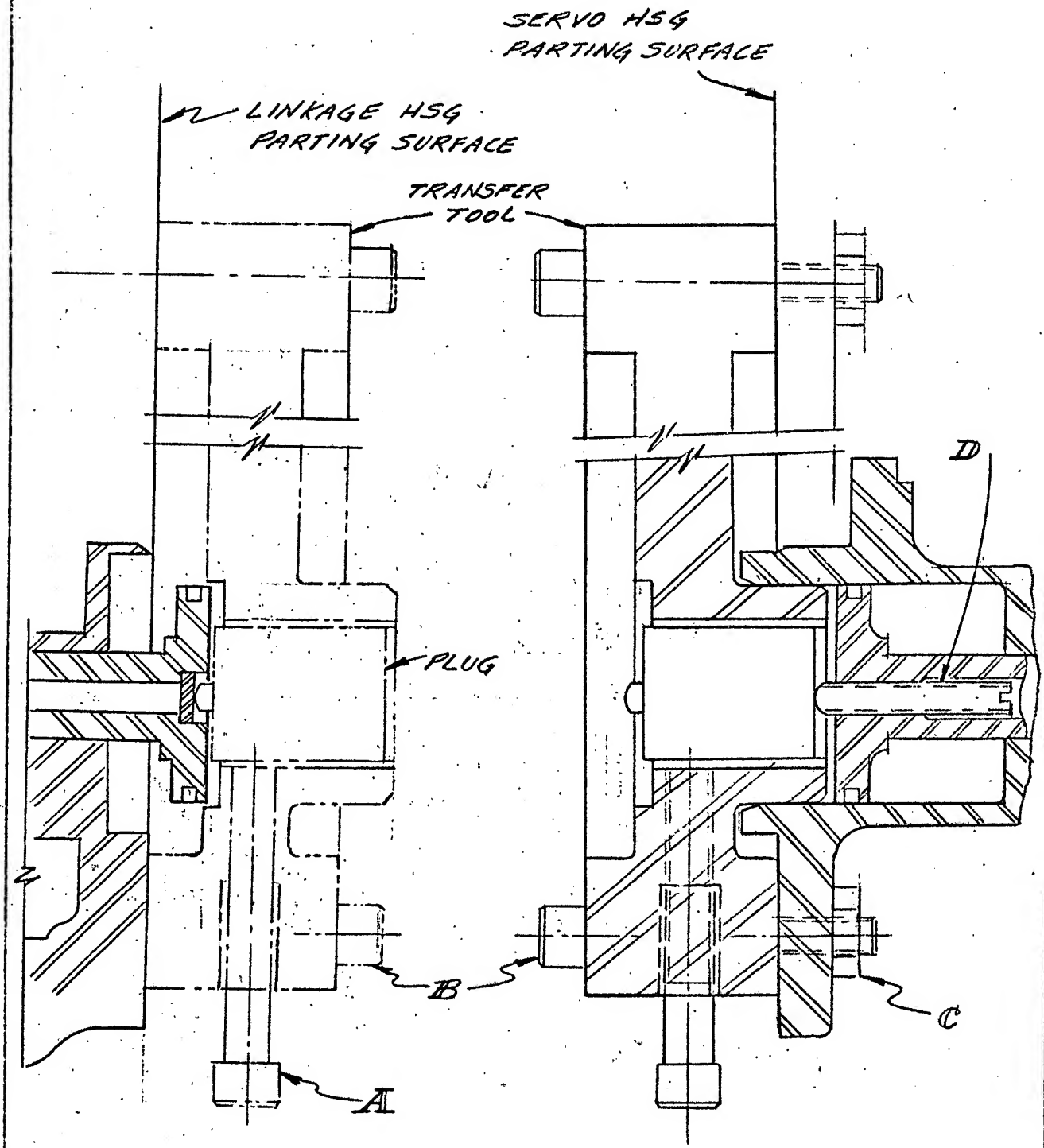
9. Repeat Step 5. using fluid (calibrating fluid or fuel) instead of air. Vary the fuel pressure from 0 to the cracking pressure (21-24 psi). Leakage from the valve shall be no more than 10 cc/min up to the cracking pressure. If leakage exceeds this value, repeat Step 1 until the leakage is sufficiently reduced.

STEP NO.	DESCRIPTION	ASSEM	INS



SET UP for SHIMMING PRV RELIEF VALVE using BALL CHECK VALVE FIXTURE 569455-T-97

STEP NO.	DESCRIPTION	ASSEM	IN



TT 2 TRANSFER TOOL

569455-T-77

LOG SHEET ASSEMBLY / TEST OPERATIONS

NO. C-

	ISSUED DATE	REVISIONS A	B	C	D	E	F	G
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PROD. ENG.								
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SHEET OF

ALL ITEMS REQUIRE SIGNATURE OF ASSEMBLY/TEST OPERATOR

ITEMS MARKED (*) REQUIRES 100% COVERAGE BY INSPECTION

SUB. ASSY NAME	ASSEMBLY NO.	ASSY. CHANGE LETTER

MAIN ASSY. NO.	MODEL NO.	PARTS LIST NO.	SERIAL NO.

STEP NO.	DESCRIPTION	ASSEM	INSP

TITLE: Documentation of Ng, Tt2, and CIP Servo Positions.

OBJECTIVE: To determine and record the position of Ng, Tt2, and CIP servos at indexed locations which will permit the setting of dial indicators at rig calibration.

REFERENCE: Figures #1, #2, and #3.

1. Ng Servo Position: With the linkage housing completely assembled and prior to completing control assembly for rig calibration, place the temperature reset cam follower into 0° to 850° F detent slot (.1425" L.P. for Y cam) of Ng speed servo cam; and while holding this position, use depth micrometer to measure distance from Ng dial indicator mounting surface on linkage housing to the top of the Ng pull rod. (Caution should be used not to collapse override spring in Ng cam during measurement).

   Record Ng pull rod position = _____.

2. CIP and Tt2 Servo Positions: With the servo housing completely assembled and prior to completing control assembly for rig calibration, place the area cam follower in the 850° F detent ("0" L.P.) of the CIP cam; and while maintaining this position, use depth micrometer to measure:

   a. Distance from CIP dial indicator mounting surface on servo housing to the top of the "outboard" cam retainer flange of the CIP cam. Record distance = _____.

   b. Distance from top of Tt2 dial indicator mounting boss on servo housing to the end of the Tt2 servo piston.

      Record distance _____.

STEP NO.	DESCRIPTION	ASSEM	INS

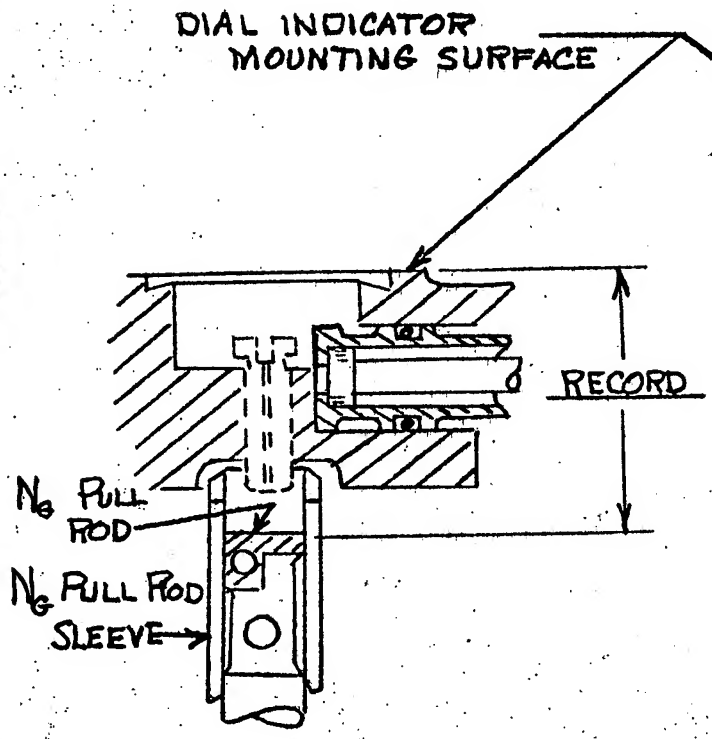

FIGURE 1. N_6 SERVO POSITION

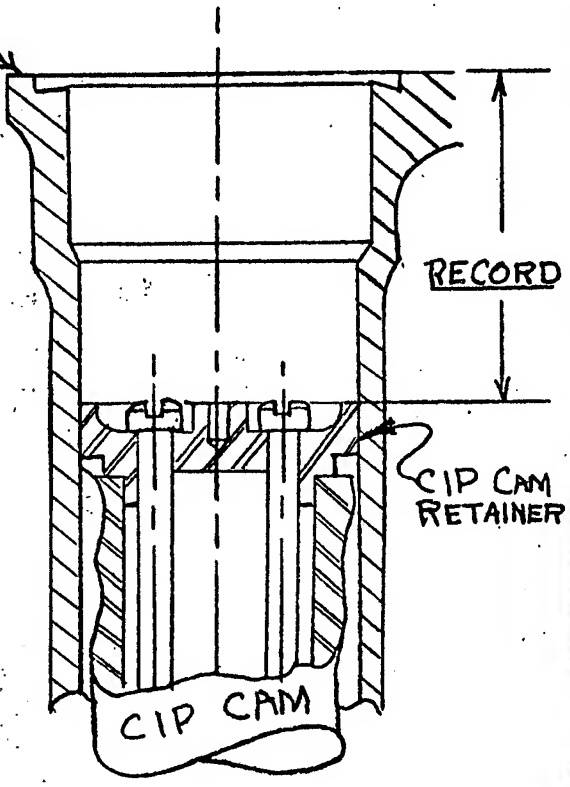

FIGURE 2. CIP SERVO POSITION

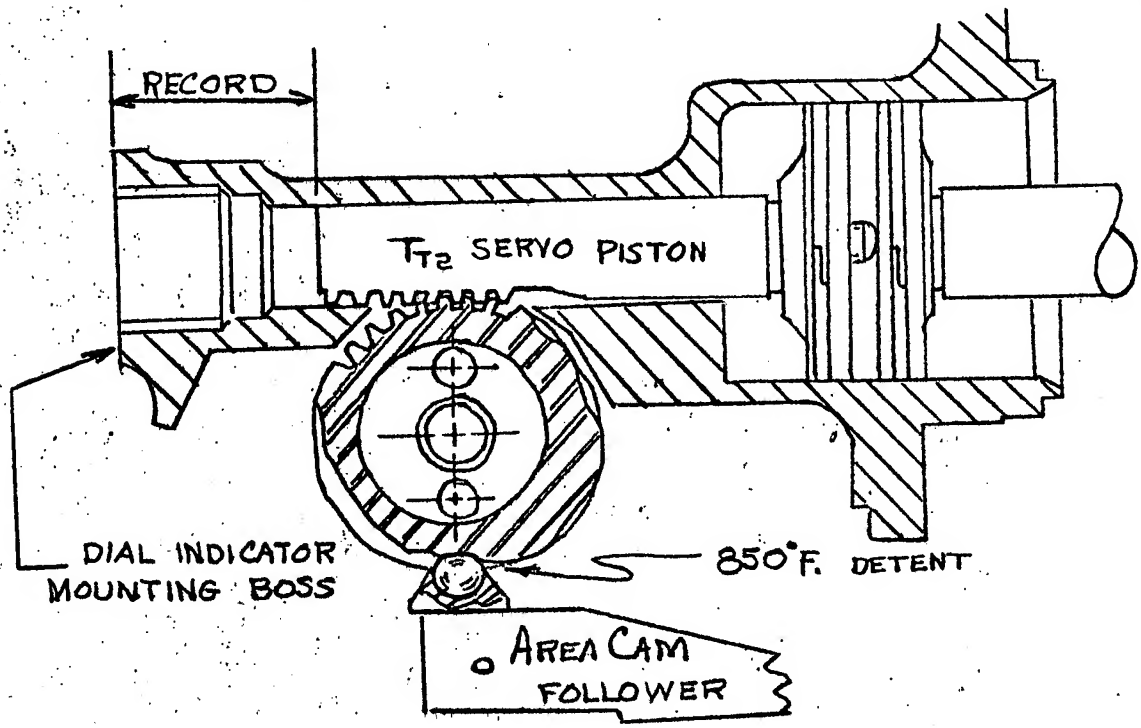

FIGURE 3 T_{T2} SERVO POSITION

INDEX

HAMILTON STANDARD
DIVISION OF UNITED AIRCRAFT CORPORATION
WINDSOR LOCKS, CONNECTICUT

H.S. 1502B
Amend. 1
Page 1 of 3
E.C. AZ 72499
Date: 10-10-62

H.S. 1502B

Amendment I

Change Page 5 to read as follows:

TITLE: Run in of PRV Sensor Assembly

OBJECTIVE: To break-in the PRV Pilot Valve, Housing, Damper and Drive Gear.

REFERENCE:

1. Assemble PRV Sensor into fixture. The bi-metallic disc retainer and the spring and seat do not have to be included in this test.

2. Adjust the Pilot Valve for Position I defined as ±.050 ±.010 displacement from "null" toward the damper end. With the PRV Sensor immersed in the test fluid (room temp. to 200°F, 10 micro filtration) drive the sensor at a speed of 3500 to 4500 RPM for four (4) hours.

3. Upon completion of above four-hour run, adjust Pilot Valve for Position II, defined as approximately null position. At this position, repeat the hours and speed called out for Position I.

4. Upon completion of Position II running, adjust pilot valve for Position III, defined as .050 ±.010 displacement from null away from damper end. Repeat the hours and speed called out for Position I.

*5. Disassemble the PRV Sensor and examine parts for distressed area following the 12 hours running. Abnormal wear or scuffing of bearing surfaces shall be cause for rejection, replacement of parts, and rerun of the 12-hour break-in.

6. Ref. Note: This procedure is the only operation necessary to match the gear to the housing.

Abnormal Wear of Scuffing is defined as follows:

1. In those areas which show contact, no deterioration in surface finish shall result.
2. No locally distressed areas are permitted (circumferential or axial scratches or chips).
3. Circumferential wear patterns if evident shall occupy no less than 90% of the total circumference for purely rotating applications (pilot valves) and no less than 60% for rotating and translating applications (servo pistons)

Quality Engineering shall ascertain if a part is acceptable using the above definitions as a guide.

Note: The Fluid Media for this test shall consist of a mixture of 10% by volume of Texaco Capella AA oil and 90% by volume of P&WA 523B fuel.

H.S. 1502B

Amendment I

Change Page 12 to read as follows:

TITLE: Run in of Speed Servo.

OBJECTIVE: To break-in the speed servo in its linkage housing.

REFERENCE: Figure titled speed servo cycling schematic.

1. Assemble and shim detail parts into linkage housing per following sections of this specification (HS 1502B)

   Sheet 14 Temperature Reset Follower and Bracket
   Sheet 6 &8 Speed Set Cam Follower Lever
   Sheet 10 CBA Cam Follower Lever
   Sheet 27 Ng Pullrod

   Assemble CBA pilot valve, spring and associated hardware to side load 3-D cam. install Ng pullrod sleeve, seal, and screws and lockwire screws. Install Ng pullrod and shoes with piston rings.
   Install Tt2 servo piston into linkage housing with a piston ring.
   Set fixture 569455-T-26 as described in Para 3. on sheet 59 so that area linkage in servo housing can be calibrated while linkage housing is being run-in.
   Install fixtures containing other half of Tt2 servo for supplying pressures to Ng and Tt2 servos.

2. Cycle the speed and temperature servos 5000 cycles, full translation and return, with test fluid (10 micron filtration). Fluid temperature to be held between room temperature and 200° F. Maximum hydraulic pressure to servos to be 500 psig.

*3. Following completion of 5000 cycles disassemble and examine the Ng servo cam shoes, pistons, rings, pullrod and sleeve and Tt2 servo bore for distressed areas. Do not remove cam shoes from 3-D cam. Do not remove piston rings from cam shoes. Abnormal wear or scuffing of bearing surfaces shall be cause for rejection, replacement of parts and rerun of the 5000 cycle break-in. Replacement of any of the parts listed in this paragraph shall be cause for repeating the break-in procedure.

Abnormal Wear or Scuffing is defined as follows:

1. In those areas which show contact, no deterioration in surface finish shall result.
2. No locally distressed areas are permitted (Circumferential or axial scratches or chips).
3. Circumferential wear patterns if evident shall occupy no less than 90% of the total circumference for purely rotating applications (Pilot Valves) and no less than 60% for rotating and translating applications (Servo Pistons).

Quality Engineering shall ascertain if a part is acceptable using the above definitions as a guide.

Note: The Fluid Media for this test shall consist of a mixture of 10% by volume of Texaco Capella AA oil and 90% by volume of P&WA 523B fuel.

H.S. 1502B

Amendment I

Change Page 32 to read as follows:

TITLE: Run in of Spider Housing Pilot Valves

OBJECTIVE: To break-in the N_g, Tt2 and T.V. Pilot Valves over their full operating ranges.

REFERENCE:

1. Install the spider housing assembly containing the N_g, Tt2 and T.V. pilot valves, the bearing housing, and the splined worm shaft into the test fixture. It is not necessary to run the bronze worm wheel and its shaft, but since this is matched to the splined worm shaft, care must be taken to prevent mixing up details.

2. Adjust N_g, Tt2 and T.V. pilot valves for Position I such that each valve is approximately at its "null" position (within ±.005). With the spider housing immersed in the test fluid, drive this input shaft at 3500 to 4500 rpm for four (4) hours. Fluid temperature is to be from room temperature to 200° F and oil is to be filtered to 10 microns.

3. After completion of the above four-hour run, adjust the N_g, Tt2 and T.V. pilot valves for Position I which is defined as .050 ±.010 displacement from null position in either direction. At this position run the spider housing for four (4) hours at 3500-4500 rpm as was done at Position I.

4. After completion of four-hour run at Position I, adjust the N_g, Tt2 and T.V. pilot valves to Position III which is defined as .050 ±.010 from null in the opposite direction from Position II. Repeat the speed and hours called our for Position I.

#5. Following the 12 hours total running, disassemble pilot valves and gear train and examine parts for distressed areas. Abnormal wear or scuffing of bearing surfaces shall be cause for rejection, replacement of parts, and rerun of the 12-hour break-in. Caution - Be sure that correct serial numbered bronze worm wheel is included with pilot valves when parts are packaged after completion of run-in.

Abnormal Wear or Scuffing is defined as follows:

1. In those areas which show contact, no deterioration in surface finish shall result.
2. No locally distressed areas are permitted (circumferential or axial scratches or chips)
3. Circumferential wear patterns if evident shall occupy no less than 90% of the total circumference for purely rotating applications (Pilot Valves) and no less than 60% for rotating and translating applications (servo pistons)

Quality Engineering shall ascertain if a part is acceptable using the above definitions as a guide.

Note: The Fluid Media for this test shall consist of a mixture of 10% volume of Texaco Capella AA oil and 90% by volume of P&WA 523B fuel.

HAMILTON STANDARD
DIVISION OF UNITED AIRCRAFT CORPORATION
WINDSOR LOCKS, CONNECTICUT

H.S. 1502B
Amend. 2
Page 1 of 1
E.C. AZ73704
Date: 11-1-63

H.S. 1502B "ASSEMBLY AND SHIMMING PROCEDURE JFC47 MAIN FUEL CONTROL"

Amendment 2

Change HS1502 as follows:

1. Delete paragraph 2.0 in its entirety.

2. Add the following to paragraph 1.2.2.

1.2.2 "569455-T-147 Speed Servo Run In Fixture
M10673 PRV and Spider Housing Run In Fixture"

3. On pages 1 and 3 of Amendment 1:

a) After the word reference add "Fixture M-10673."
b) Delete the asterisk preceding paragraph 5.
c) Change the next to last sentence to read "Quality Engineering or Inspection Supervision shall ascertain ..."
d) Change the note at the bottom of the page to read "The Fluid Media for this test shall be Dominion "A" Spindle oil that has been passed through a 10 micron-nominal filter."

4. On page 2 of amendment 1:

a) After the word "schematic" in the reference add "Fixture 569455-T-147."
b) Delete the asterisk preceeding paragraph 3.
c) Change the next to last sentence to read "Quality Engineering or Inspection Supervision shall ascertain ..."
d) Change the note at the bottom of the page to read "The Fluid Media for this test shall be Dominion "A" spindle oil that has been passed through a 10 micron-nominal filter."

HAMILTON STANDARD
DIVISION OF UNITED AIRCRAFT CORPORATION
WINDSOR LOCKS, CONNECTICUT

H.S. 1502B
Amend. 3
Page 1 of 3
E.C. 73645
Date: 11-6-62

HS 1502B "ASSEMBLY AND SHIMMING PROCEDURE JFC47 MAIN FUEL CONTROL"

Amendment 3

1. Add attached procedure titled "Torque Test of Trimmer Click Locks"

2. Add paragraph 9 and accompanying sketch to page 28.

9. "After the Ng and SIP cams are completely assembled, inspect completed cam and cam shoe assemblies to insure that cams shoes A and B are parallel with each other within .0005 F.I.R. and that the surface defined by O.D. "A" is parallel to the surface defined by OD. "B" within .0005 for any rotational position."

HAMILTON STANDARD
DIVISION OF UNITED AIRCRAFT CORPORATION
WINDSOR LOCKS, CONNECTICUT

H.S. 1502B
Amend. 3
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H.S. [illegible] ASSEMBLY AND SHIMMING PROCEDURE JFC47 MAIN FUEL CONTROL"

Amendment 3

TITLE: Torque Test of Trimmer Click Locks

OBJECTIVE: To determine the torque required to rotate the military and idle adjustment screws.

REFERENCE: 56M55-[illegible]55 Adapter Trimmer Screw Torque Wrench

Assemble retaining screws, springs, and click locks into retainer and check click lock torque wrench. This torque must be 1.5 to 3.0 in #. If the torque does not meet this requirement adjust the click lock nuts in or out until the above torque requirement is met.

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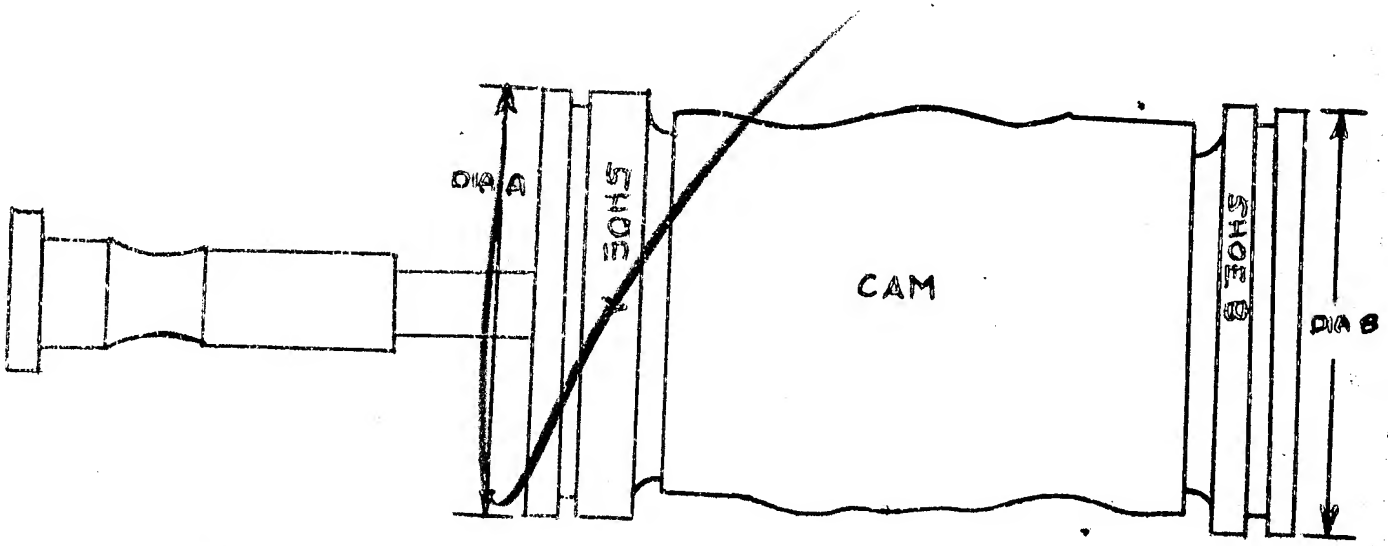


COMPLETE CAM AND SHOE ASSEMBLY

HAMILTON STANDARD
DIVISION OF UNITED AIRCRAFT CORPORATION
WINDSOR LOCKS, CONNECTICUT

H.S. 1502
Amend. 4
Page 1 of 3
E.C. AZ7622
Date: 11-26-62

H. S. 1502 "ASSEMBLY AND SHIMMING PROCEDURE, JFC47 MAIN FUEL CONTROL"

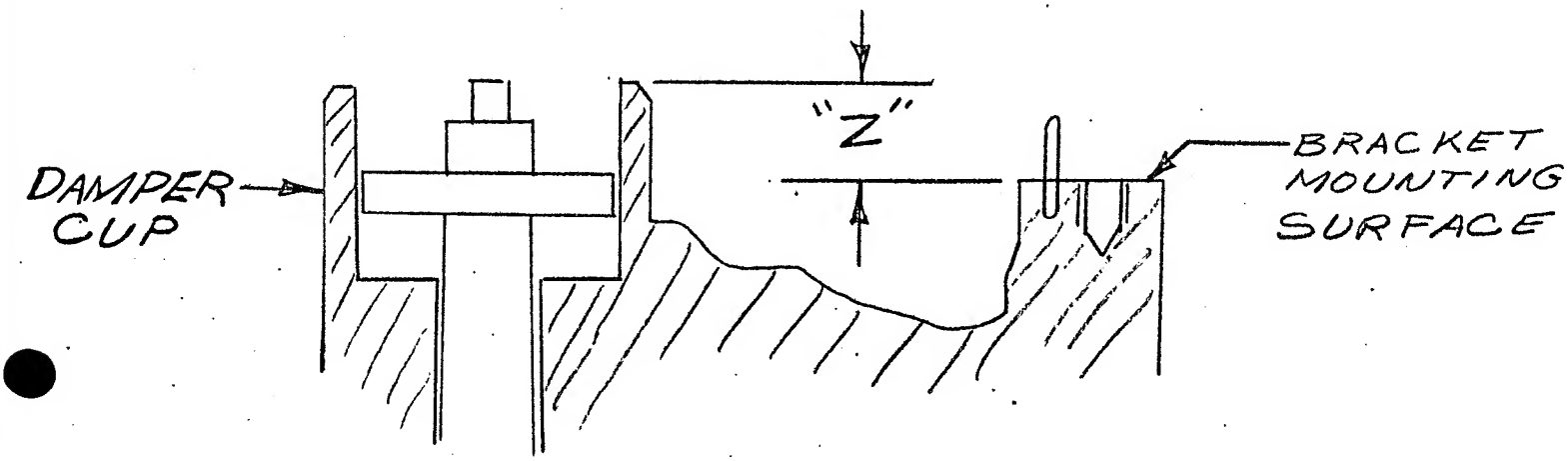
Amendment 4

1. Add the Ng Governor anit rotation bracket shimming procedure per attached sheets.

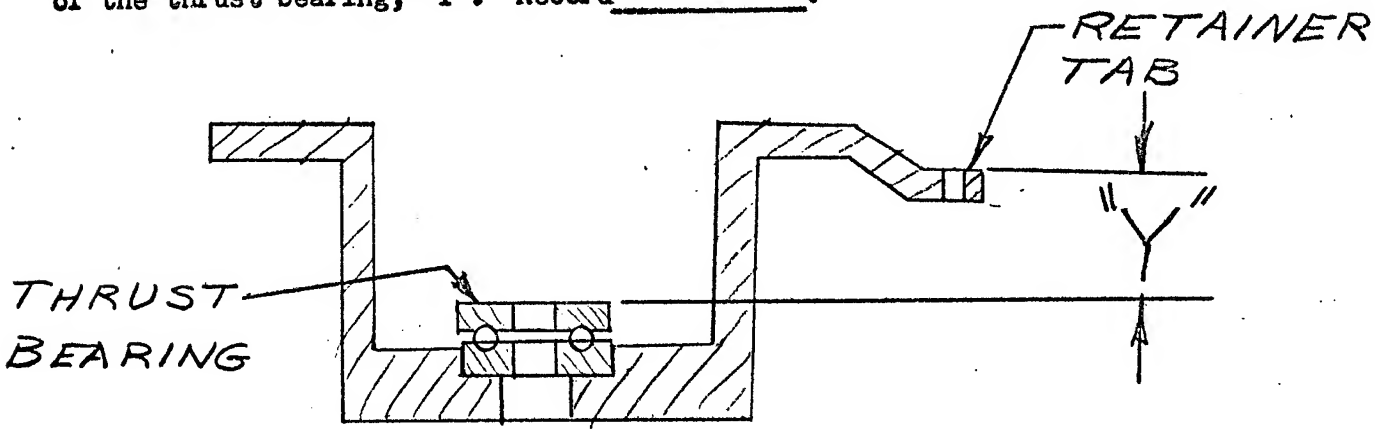
TITLE: Ng Governor Anti-Rotation Bracket Shimming

OBJECT: To shim the anti-rotation bracket so that anti-rotation link is perpendicular to the axis of the Ng pilot valve at its null condition.

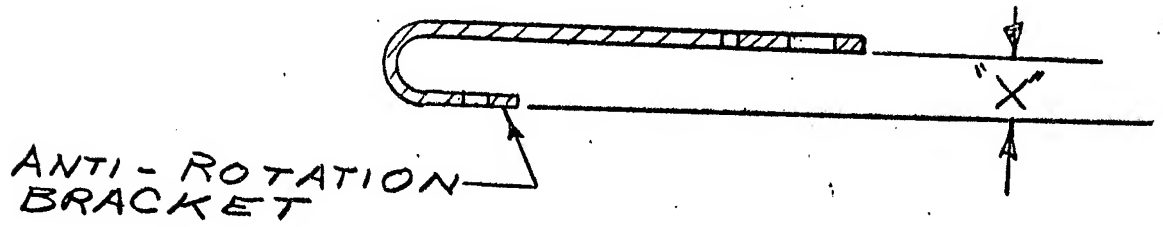
1. Measure the distance from the bracket mounting surface to the top of the Ng damper cup "Z". Record _____.



2. Measure the distance from the top of the Ng spring retainer tab to the top of the thrust bearing, "Y". Record _____.



3. Measure the anti-rotation bracket from the mounting surface to link attachment surface "X". Record_____.



4. Determine the Ng pilot valve "S" dimension from the component pressure sensitivity data. Record_____.

5. The thickness of shims to add between the bracket and the bracket mounting surface is as follows:

$$\text{Shims} = Y+Z+S-X$$

1.0 Scope

The purpose of this specification is to provide a pressure test procedure for Stainless steel Brazed housings used on the JFC-51 in order to insure detection of minute leaks.

2.0 Equipment Required

2.1 A pressure test rig capable of maintaining 1750 ± 20 psi for 15 minutes with seepage from the Housing being tested.

2.2 Pressure gages

High pressure 0-2000 psig 2000-psig, 1% Accuracy
Low pressure 0-500 psig 1% Accuracy

2.3 Suitable fixtures to apply pressure to the high pressure area, as specified on the applicable blue print, and to bleed air from the area being tested.

2.4 Suitable fixtures to apply pressure to the low pressure area, as specified on the applicable blue print, and to bleed air from the area being tested.

3.0 TEST FLUID

Test fluid shall be MIL F-7024A type II or corrosion inhibited demineralized water (potassium dichromate, .1% - .2% by weight.)

4.0 DEFINITION OF EXTERNAL LEAKAGE

With the required pressure applied to the designated portion of the housing, remove all traces of fluid from the exterior surfaces. The term "no leakage" shall be defined as no appearance of fluid on the external surface of a housing, including no seepage or wetting on the surface, regardless of the fact that fluid does not run off the surface of the housing or forms droplets.

5.0 METHOD OF TEST

5.1.0 Leak test of high pressure area.

5.1.1 Install suitable fixtures to pressurize the high pressure area of the housing as designated by the applicable blue print. Apply pressure and bleed air from this area. Increase pressure to 1750 ± 20 psig and hold for 5 minutes.

5.1.2 Cycle pressure from 100psig to 1000 psig 50 times. Time required to increase pressure from 100psig to 1000 psig should be .5 - 12 seconds for each cycle.

5.1.3 Apply 1750 ± 20 psig in high pressure area and hold for 15 minutes. There shall be no external leakage during this time.

5.2.0 Leak test of low pressure area.

5.2.1 Install suitable fixtures to pressurize the low pressure area of the housing as designated by the applicable blue print. Apply pressure and bleed air from this area. Increase pressure to 175 ± 20 psi and hold for 5 minutes.

5.2.2 Cycle pressure from 50psig to 175 psig 50 times. Time required to increase pressure from 50psig to 175 psig should be .05 - 12 seconds for each cycle.

5.2.3 Apply 175 ± 20 psig in low pressure area and hold for 15 minutes. There shall be no external leakage during this time.

1.0 SCOPE

This specification describes the special phases of assembly which are not included in the appropriate assembly drawing of Exhaust Nozzle Control, 57[illegible]7c.

2.0 DESCRIPTION

The exhaust nozzle control consists essentially of a regulating valve, a half-area valve, a feedback piston lever, two extension springs, four compression springs, a control shaft, a proximity damper and two housings. The actuating signal for the unit is received from the main fuel control. It, in turn, varies the position of the actuators for the exhaust nozzle.

3.0 [illegible]

3.1 [illegible]

[illegible]
[illegible]
[illegible]
[illegible]
5. 11.6 ± [illegible] Load For Half Area Servo Calibration
[illegible] Calibration
7. [illegible] 12.4#, and four .1# Loads For Setting Feedback Leger
8. [illegible] for Feedback Lever
9. Protractor For Control Lever
10. [illegible] and Pin
11. Tool for Inserting 69512-4 Nut
12. Tool for [illegible] Stop Spring
13. Tool for Inserting 11.6# Load to Half Area Piston
14. Leg Mounting Fixture
15. Installation Fixture
16. Piston Ring Compression Tool

3.2 [illegible]

[illegible] -5263

4.0 [illegible]

4.1 [illegible]

All parts shall be kept free of dirt, dust, grit and other foreign matter.

[illegible] shall be torqued 125 - 140 in. lbs. Apply [illegible] for two threads and face of all internal [illegible] to all seals.

4.2 [illegible]

4.2.1 Move the half area piston and pin 572571 from housing 573166. Assemble the half area piston and pin to the connecting rod 573[illegible] using two sleeve bearings [illegible], bolt [illegible], and locknuts MS20365N20.

4.2.2 Assemble spring retainer 573173 to the connecting rod using two (2) sleeve spacers 571565 and hollow pin 69538A9-10.

4.2.3 Place spring 573172 into its respective bore in the housing. Assemble .050" of shim 571577 and washer 69387-21 on top of the spring. Note that washer must be in contact with spring. Install the complete piston assembly (Ref. paragraph 4.2.2) into the housing bore, carefully aligning the piston with the bore. Note that there must be no evidence of binding between piston and bore.

4.2.4 Install servo shim fixture 571575-T-2 to the housing using seven (7) screws 69408825-8 and gasket 69397A-22. Apply a 11.6 pound load to the piston pin. Take the complete assembly to the test rig for pressure calibration. Ref. HS spec. 1508B.

4.2.5 Assemble shims 571577, determined at pressure calibration, piston stop 575982, and retaining ring 69983S-112 into the piston cover 575983.

4.2.6 Install piston cover 575983 to the housing using gasket coupling 69397A-22 and seven (7) bolts 69408825-8. Secure attaching bolts with lockwire MS 20995C32.

4.3 Assembly of Control Shaft Cover 573334

4.3.1 Install bearing 88948 and sleeve spacer 557116 into the bore of housing.

4.3.2 Assemble spring retainer 565758 to spring 576855 and then to connecting link 557115 using headed pin 69725-4018 and cotter pin MS24665-149.

4.3.3 Slide this assembly, spring retainer and connecting link first, into the bore of housing until the connecting link is in the bore ready to receive the control shaft.

4.3.4 Carefully slide the control shaft 557114 through the connecting link, spacer, and bearing. Install gasket 69590-20 to housing surface.

4.3.5 Assemble rotary seal assembly 574153, ring 69588A24, two (2) metallic chevron gaskets 69588-21, and packing retainer 69587B24 to the control shaft.

4.3.6 Install flat spacer 570165, bearing 89016, retaining ring 69965887, and washer 568069 into control shaft cover 573334.

4.3.7 Attach control shaft cover 573334 to the housing 571700 using seven screws (not [illegible]). Secure screws with lockwire MS20995N32. Install retaining ring 69586A-037 to control shaft.

4.4 Assembly of P.R.V. Nozzle and Feedback Lever Bracket

4.4.1 Assemble metallic gasket 69403A23, tab washer 573846, and P.R.V. nozzle 557207 into the housing and tube 571700. Secure the P.R.V. nozzle assembly

4.4.1 (continued)
to the housing by bending one end of the washer up against the hex on the nozzle and the other end down against the housing.

4.4.2 Reference note 9, Assembly Dwg. 576376 prior to assembly of bracket to determine whether or not spacer 576815 is to be installed. Assemble feedback lever bracket 577144 into the housing using four screws 69691A45 and lockwire using MS20995N20. The lockwire must not cover the spring seat.

4.5 Assembly of Adjusting Lever

4.5.1 Assemble adjusting screw 576818 to feedback lever 578883. Assemble piston adjusting lever 573183 to feedback lever 578883 using two (2) straight headed pins 69725-L620, two (2) cotter pins MS24665 1L9, and a washer AN960C6.

4.5.2 Place one shim 577145 into the counterbore in bracket 577144. Slide lever assembly into the housing. Place spring 577135 into the counterbore in bracket 577144. Engage the lever assembly with bracket 577144 using hollow pin 69538A8-20.

4.5.3 Attach spring 576 [illegible] the lever assembly.

4.5.4 Measure the distance from the housing parting line to the top of pin 69538A8-20. To this dimension add one half of the pin diameter which is .0425 plus .0062. Then let this sum be known as "X". Measure and record the distance from the housing parting line to the top of spring retainer lip, and the distance between the spring retainer lip and spring seating surface of feedback lever 578883, first making certain the lever is bottomed. Let the sum of these two dimensions represent "Y". Turn adjusting screw 576818 until dimension "Y" equals "X" dimension. With the feedback lever set at the required dimension as determined by the above, position the control shaft 557114 so that its missing tooth is in line with the index hole on the control shaft cover. Install a dial indicator against the adjusting screw 576818. With the dial indicator at zero, apply a pulling force at the supporting pin for the spring 576814 and record the force required to move the feedback lever .005 inch at the adjusting screw. Take this force, enter the force balance adjustment chart and determine the proper amount of shims to be added. Add and record the number of shims 577145 until the correct load is obtained. Do not use more than seven full shims.

4.5.5 Upon the completion of the shimming, install adjusting screw 579283-1 to adjusting lever 573183, and locking screw 579283-2 to lever 578883. Check adjusting lever 573183 for freedom of movement. Disassemble feedback lever assembly if corrective action is necessary.

4.6 Assembly of Pilot Valve

4.6.1 Before assembly, check the pilot valve for "free fall" within the housing bore. Assemble adjusting screw 69458A10-[illegible], flat washer 576868, and shim 576340 to the pilot valve. Assemble feedback connector 576826 to the pilot valve with hollow pin 69538B9-7 and lockwire with MS20995N20. Install piston 69538B9-7 and lockwire with MS20995N20. Install piston ring 69353-24 to the pilot valve ring groove. Install the outside portion of the piston ring in such a manner that the breaks in the rings are 180° apart.

4.6.2 Use piston ring tool 571575-T-23 to compress piston ring and carefully slide the pilot valve assembly with feedback connector first into the bore of housing. Position the pilot valve against the internal stop. Install gasket

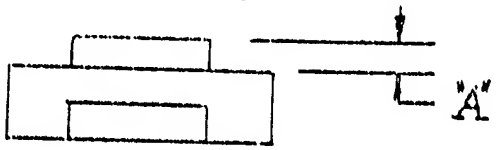
4.6.2 (continued)
69559A12 and plug AN814-10CL to housing 571700. Move the pilot valve from end to end and record the total travel. The total travel of the valve from the internal stop to the position where the valve bottoms must equal the criginal "S", which is taken from the valve flow data, plus .060 maximum. The minimum value is .040. If valve travel does not meet the determined value, add or subtract shims 576340 until the required value is obtained.

4.6.3 Assemble spring 573168, spring retainer 576859, and self locking nut 69512-4. Adjust the nut until the spring retainer just contacts the spring. Then turn the nut down four complete turns.

4.7 Damper Assembly

4.7.1 Assemble adjustable alignment shaft 576782 and friction collar 576785 into adjusting plate 576786. Slide fixture 571575-T-6 over the alignment shaft and bottom it. Using a depth micrometer measure from the top of adjusting plate to the top of the friction collar. Record this dimension.

4.7.2 Measure dimension "A" on spring retainer 576783.



Subtract this measurement from that obtained in 4.7.1 and then subtract .068 inch from this difference. This amount is the required thickness of shim 576845.

4.7.3 Remove fixture 571575-T-6. Assemble shim 576845, spring 576784, spring seat 576783, and internal retaining ring 699838-50 into adjusting plate 576786. Compress spring using compression tool in order to assemble snap ring.

4.7.4 Assemble the hardware in 4.7.3 into damper adjusting housing 576786 and retain with self locking nut 69512-4.

4.7.5 Screw the stationary feedback plate 576788 into the lever 571554 until it bottoms.

4.8 Assemble Spring 576812 to Pin in the half area servo.

4.8.1 Place spring tension washer 576819 and damper assembly into bore in the half area housing.

4.8.2 Place metallic face seals 568405-81, -81, and -162 and metallic face seal sleeves 568406-81 and -81 into their proper locations on the housing.

4.8.3 Install the complete half area housing assembly to the housing and valve assembly. Engage spring 576812 with pin 69725-4G20, which is in the lever assembly. Make certain spring 576812 is securely attached at two ends. Install seven screws 694088825-11 and lockwire using MS20995N32.

4.8.4 Adjust damper screw 576782 clockwise until it bottoms. Back off screw (counterclockwise) one third of a turn. Hold the screw in this position and tighten self locking nut 69512-4. Assemble plug AN814-8CL and metallic gasket 69559A12.
Check adjusting screws 579283-1 and -2 for safety. Center the Hollow Pin 69536AC-20 on the feedback lever bracket 577144.

4.9 Assemble metallic face seal sleeve 568406-205, metallic face seal 568405-206, linkage cover 571561 and secure with nine screws 69408B25-7.

4.10 Assemble name plate 69444B4 to housing using two drive screws 69415-0-2.

4.10.1 Assemble plug AN814-2CL and metallic gasket 69559A5 to the housing.

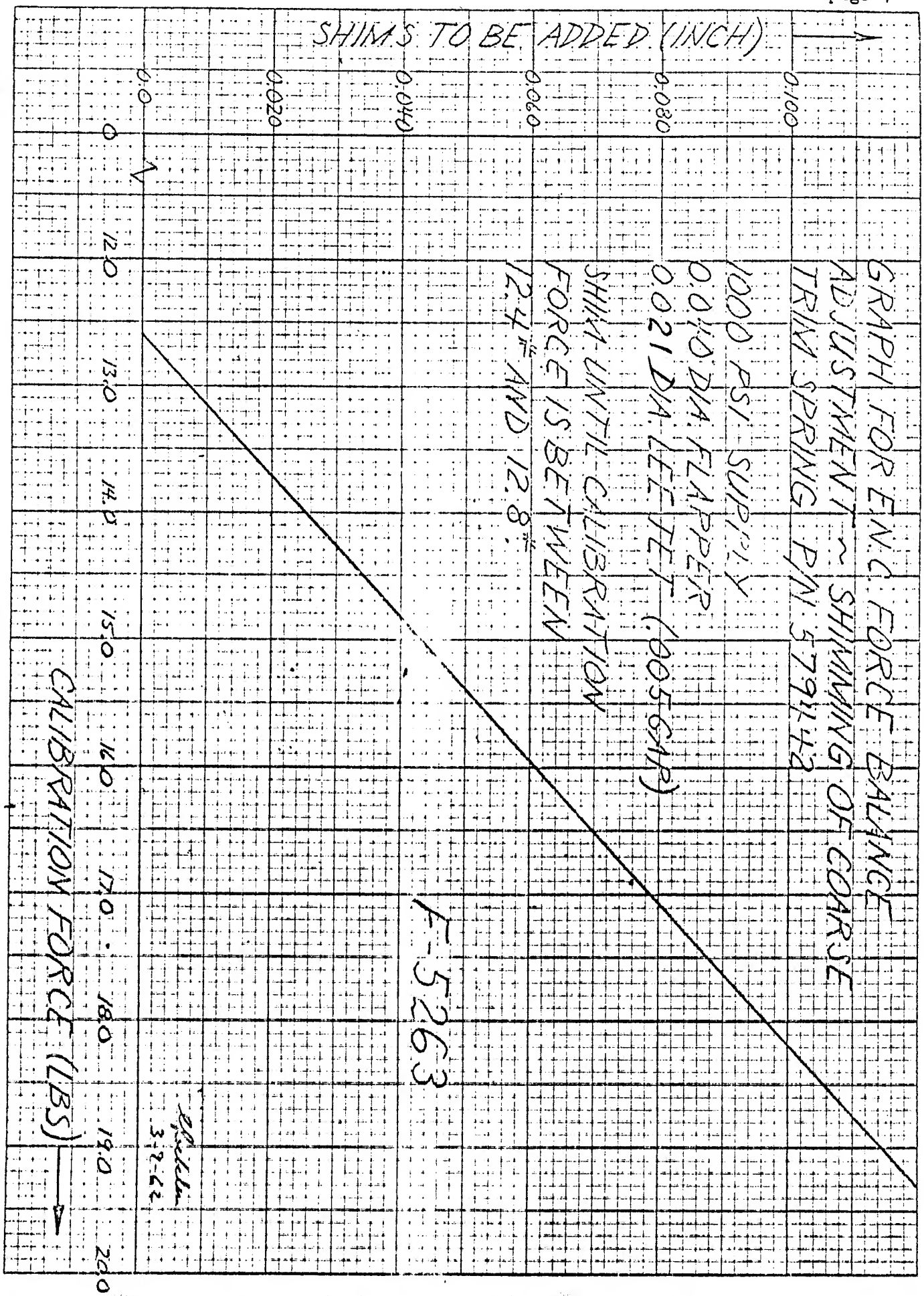
4.10.2 Upon completion of test per HS spec. 1508B lockwire all external screws, covers and fittings per assembly dwg. 576576.

5.0 PRESERVATION FOR STORAGE

After completion of testing, the exhaust nozzle control assembly shall be drained of fuel and prepared for storage in accordance with H.S. Specification No. 380.

6.0 PREPARATION FOR SHIPPING

Each unit shall be completely free of internal and external foreign material at the time of packaging and during shipment. All ports shall be capped with suitable plastic caps or their equivalent.



H.S. 1572 B "Exhaust Nozzle Control, Assembly of"

Amendment 1

1. Change Paragraph 4.5.1 from:

"4.5.1 Assemble adjusting screw 576818 to feedback lever 578883. Assemble piston adjusting lever 573183 to feedback lever 578883 using two (2) straight headed pins 69725-4620, two (2) cotter pins MS24665-149, and a washer AN960C6."

To read:

"4.5.1 Assemble two (2) adjusting screws 576818 and 579283-2 to feedback lever 580725. Record the inst. torque of the 579283-2 screw. Assemble piston adjusting lever 580727 to feedback lever 580725 using two (2) straight headed pins 69725-4620, two (2) cotter pins MS24665-149, and a washer AN960C6."

2. Change Paragraph 4.5.5 from:

"4.5.5 Upon the completion of the shimming, install adjusting screw 579283-1 to adjusting lever 573183, and locking screw 579283-2 to lever 578883. Check adjusting lever 573183 for freedom of movement. Disassemble feedback lever assembly if corrective action is necessary."

To read:

"4.5.5 Upon the completion of the shimming, install adjusting screw 579283-2 to adjusting lever 580727. The installation torque of the 579283-2 screw through the heli-coil mid-grip in the lever must be 2.0-13.0 in. lbs. Check adjusting lever 573183 for freedom of movement. Disassemble feedback lever assembly if corrective action is necessary."

3. Change Paragraph 4.6.3 from:

"4.6.3 Assemble spring 573168, spring retainer 576859, and self locking nut 69512-4. Adjust the nut until the spring retainer just contacts the spring. Then turn the nut down four complete turns."

To read:

"4.6.3 Assemble spring 573168, spring retainer 576859, and self locking nut 69512-4. The installation torque of the nut along the screw threads must be 2.0-13.0 in. lbs. Adjust the nut until the spring retainer just contacts the spring. Then turn the

H.S 1572 B "Exhaust Nozzle Control, Assembly of"

Amendment 1

4. Change Paragraph 4.5.4 from:

"4.5.4 Measure the distance from the housing parting line to the top of pin 69538A8-20. To this dimension add one half of the pin diameter which is .0425 plus .0062. Then let this sum be known as "X". Measure and record the distance from the housing parting line to the top of spring retainer lip, and the distance between the spring retainer lip and spring seating surface of feedback lever 578883, first making certain the lever is bottomed. Let the sum of these two dimensions represent "Y". Turn adjusting screw 576818 until dimension "Y" equals "X" dimension. With the feedback lever set at the required dimension as determined by the above, position the control shaft 557114 so that its missing tooth is in line with the index hole on the control shaft cover. Install a dial indicator against the adjusting screw 576818. With the dial indicator at zero, apply a pulling force at the supporting pin for the spring 576812 and record the force required to move the feedback lever.005 inch at the adjusting screw. Take this force, enter the force balance adjustment chart and determine the proper amount of shims to be added. Add and record the number of shims 577145 until the correct load is obtained. Do not use more than seven full shims.

To read:

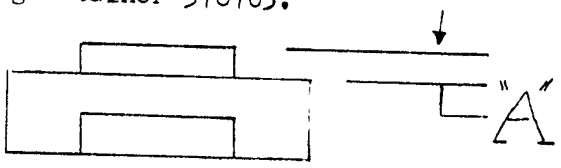
"4.5.4 Measure the distance from the housing parting line to the top of pin 69538A8-20. To this dimension add one half of the pin diameter which is .0425 plus.0062. Then let this sum be known as "X". Measure and record the distance from the housing parting line to the top of spring retainer lip, and the distance between the spring retainer lip and spring seating surface of feedback lever 580725 first make certain that the lever is bottomed. Let the sum of these two dimensions represent "Y". Turn adjusting screw 576818 until dimension "Y" equals "X" dimension. With the feedback lever set at the required dimension as determined by the above, position the control shaft 557114 so that its missing tooth is in line with the index hole on the control shaft cover. Install a dial indicator against the adjusting screw 576818. With the dial indicator at zero, apply a pulling force at the supporting pin for the spring 576812 and record the force required to move the feedback lever .005 inch at the adjusting screw. Take this force, enter the force balance adjustment chart and determine the proper amount of shims to be added. If the force is less than 12.6#, no shims are required. Add and record the number of shims 577145 until the correct load is obtained. Do not use more than seven full shims.

H.S. 1572 B "Exhaust Nozzle Control, Assembly of"

Amendment 1

5. Change Paragraph 4.7.2 from:

"4.7.2 Measure dimension "A" on spring retainer 576783.



Subtract this measurement from that obtained in 4.7.1 and then subtract .468 inch from this difference. This amount is the required thickness of shim 576845."

To read:

"4.7.2 From the dimension obtained in 4.7.1 subtract 0.585 inch (Nom. Dim.). This amount is the required thickness of shim 576845."

6. Change Paragraph 4.7.4 from:

"4.7.4 Assemble the hardware in 4.7.3 into damper adjusting housing 576786 and retain with self locking nut 69512-4."

To read:

"4.7.4 Assemble the hardware in 4.7.3 into damper adjusting housing 576819 and retain with self locking nut 69512-4. The nut and the adjusting screw must have an installation torque (torque required to move the nut along the screw and the screw through the helicoil in the housing) of 2.0-13.0 in. lbs."

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H.S. 1572B
Amend. 2
Page 1 of 2
E.C. 72505
Date: 10-3-62

H.S. 1572B "EXHAUST NOZZLE CONTROL, ASSEMBLY OF"

Amendment 2

1. Change paragraph 4.2.3 from:

"Place spring 573172 into its respective bore in the housing. Assemble .050" of shim 571577 and washer 69387-21 on top of the spring. Note that washer must be in contact with spring. Install ....."

to read:

"Place spring 573172 into its respective bore in the housing. Assemble .050" of shim 571577 and washer 69387-21 on top of the spring. Peel laminated shims in accordance with Fig. 1. Note. that washer must be in contact with spring. Install ....."

2. Change paragraph 4.5.2 from:

"Place one shim 577145 in to the counterbore .....

to read:

"Place eight shims 577145 into the counterbore ....."

3. Change paragraph 4.5.4 from:

.....With the dial indicatore at zero, apply a pulling force at the supporting pin for the spring 576812 and record the force required to move the feedback lever .005 inch at the adjusting screw. Take this force, enter the force balance adjustment chart and determine the proper amount of shims to be added. Add and record the number of shims 577145 until the correct load is obtained. Do not use more than seven full shims.

to read:

.....With the dial indicator at zero, apply a pulling force at the supporting pin for the spring 576812 and record the force required to move the feedback lever .005" inch at the adjusting screw. This force must be 11.6 ± .2 lb. However, with 8 shims under the lever the force should be too high. To decrease the load rotate the spring 577135 clockwise or counter-clockwise 180°. Rotation has the effect of slightly more than one shim addition. Precise adjustment of lever load cam thus be provided. For best ENC performance as many shims as possible should be used. This reduces backlash in the lever pivot pin. Under no conditions should sufficient shims be added to cause the spring to go to solid height when the flapper hits the nozzle.

4. Add the attached figure.

HAMILTON STANDARD

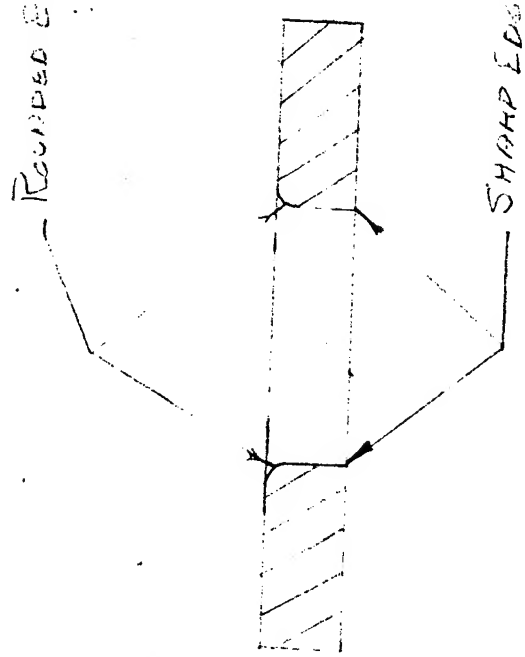

FIG I

CORRECT METHOD OF TEARING ALUMINUM TAPE SKINS

1. ALWAYS TEAR STRIPS FROM ROUNDED EDGE TOWARD SHARP EDGE.
2. REMOVE ANY AND ALL BURRS. SKINS MUST BE FREE FROM BURRS AND SHARP EDGES.
3. USE THIS TECHNIQUE ON ALL ALUMINUM TAPED SKINS

HAMILTON STANDARD
DIVISION OF UNITED AIRCRAFT CORPORATION
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H.S. 1572B
Amend. 3
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E.C. AZ73638
Date: 12-16-62

H.S. 1572B "EXHAUST NOZZLE CONTROL, ASSEMBLY OF"

Amendment 3

1. Delete page 7 (Graph F-5263).